Defined benefit plan retentions and pension buy-ins/buy-outs: Evidence from the UK.

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I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

Signature: …….

ABSTRACT

This thesis consists of three self-contained papers on defined benefit (DB) pension provision in the United Kingdom (UK). In particular, in the first paper, I examine the effect that labour market incentives, managerial incentives and the adoption of FRS17 by UK firms, have on DB plan retention decisions. In this paper, I also examine the role of insider trustees, defined as trustees that are also company executives, on the firm's decision to keep DB plans open. I find that firms for which human capital is especially important are more likely to retain their defined benefit plans. In addition, CEO and CFO membership in the same pension plan that is provided for other employees positively influences the retention of defined benefit pension plans. Additional analysis using a subsample for which data on pension plan trustees are available suggests that being a CEO and a trustee increases the probability of DB plan retentions. Moreover, being a CEO/CFO trustee and a member of the DB plan offered to all employees increases the likelihood of DB plan retention. However, I do not find any evidence that voluntary adoption of FRS 17 influences DB plan retention. In addition, I find that insider-trustees have a positive influence on the decision to maintain DB plans, especially when they are members of these plans.

In the second paper, I look at the effect of DB plan retentions and executive membership in them, on corporate credit ratings and the investment and dividend decisions. Empirical findings suggest that firms which continue to sponsor DB plans are more likely to have lower credit ratings which are exacerbated when these plans are underfunded. Despite the above effect however, I find that if the CEO is a member of the DB plan, it positively affects credit ratings. In addition, I find some evidence that the participation of CEOs in the main DB plans in conjunction with overfunded pension plans, negatively affect investment decisions when these schemes remain open. I do not find any association between CEOs membership in the main DB plan and dividend payments which may be explained by the market signalling effects of dividends.

Finally, in the third paper, I provide a thorough analysis of the pension buy-in and buy-out market in the UK, and I empirically examine the determinants of such transactions from a firm and plan perspective. I find that firms that implement buy-ins have larger and more funded pension plans, are more profitable and have higher union densities. Moreover, firms that complete buy-outs have larger

pension plans and allocate less pension assets in equity. Moreover, the number of employees is negatively associated with both transactions implying it is costlier for firms to conduct either a buy-in or buy-out transaction. While union density is positively associated with buy-ins, it has a negative effect on the likelihood of buy-outs suggesting that unions support buy-in but not buy-out transactions. This may be potentially explained by the fact that the latter are associated with with plan winding-ups.

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Abbreviations

ASB	Accounting Standards Board
ASC	Accounting Standards Committee
CB	Cash Balance
CEO	Chief Executive Officer
CFO	Chief Financial Officer
DB	Defined Benefit
DC	Defined Contribution
ED	Exposure Drafts
EFRBS	Employer- Financed Retirement Benefit Schemes
ERISA	Employee retirement income security act
FASB	Financial Accounting Standards Board
FRS 17	Financial Reporting Standard 17
FSA	Financial Services Authority
FURB	Funded unapproved retirement benefits scheme
FVPA	Fair value of plan assets
IAS	International Accounting Standards
IASB	International Accounting Standards Board
IFRS	International Financial Reporting Standards
LCP	Lane, Clark and Peacock
MFR	Minimum Funding Requirement
MNT	Member-nominated trustees
NAPF	National Association of Pension Funds

NPV	Net present value
OCI	Other comprehensive income
ONS	Office for National Statistics
OPRA	Occupational Pensions Regulatory Authority
P&L	Profit and Loss
PBO	Present Value of Obligation
PPF	Pension Protection Fund
R&D	Research and Development
SERP	Supplemental Executive Retirement Plan
SERPS	State Earnings - Related Pension Scheme
SFAS	Statement of Financial Accounting Standards
SFO	Statutory funding objective
SIP	Statement of investment principles
SORIE	Statement of recognised income and expense
SSAP 24	Statement of Standard Accounting Practice 24
STRGL	Statement of total recognised gains and losses
UK	United Kingdom
US	United States
UURBS	Unapproved retirement benefits scheme

Chapter 1: Introduction

1.1 Motivation and synopsis

This thesis is motivated from the enormous economic significance that defined benefit (DB) plans and their associated risks have on corporations, governments and individuals. The issue of retirement funding in the United Kingdom (UK) and elsewhere has never been more relevant. Demographic statistics show that life expectancy has increased significantly and there is an on-going concern about the welfare of retirees (Blake, Cairns, Coughlan, Dowd and Macminn, 2013). In most economies, occupational pension schemes are seen as an important source of retirement income and typically receive preferential tax treatment (Kiosse and Peasnell, 2009). Traditionally, most companies have sponsored final salary DB pension schemes, which offer a high level of income security after retirement (Yermo and Severinson, 2010). However, new regulatory and demographic changes as well as recent developments in the general economic climate have significantly increased the cost of those schemes (Yermo and Severinson, 2010; Kiosse and Peasnell, 2009). These changes have ultimately led to the reduction of benefits provided to new and/or existing members or even the termination[1] of DB plans during the last three decades (Munnell, 2006; Glaum, 2009; Kiosse and Peasnell, 2009). Existing literature has extensively examined the determinants of DB plan closures and among others identifies managerial incentives (Hamdallah and Ruland, 1986); cash needs (Thomas, 1989); avoidance of future obligations (Petersen; 1992); changes in accounting regulation (Munnell and Soto, 2007; Beaudoin, Chandar and Werner, 2010; Comprix and Muller, 2011); and changes in labour characteristics and preferences (e.g., Cowan and Power, 2003; Coronado and Copeland, 2004; Aaronson and Coronado, 2005; Kapinos, 2012; D'Souza, Jacob and Lougee, 2013). Notwithstanding, the benefits emanating from the termination or conversion of DB pension plans,[2] are still an important component of the compensation package as this deferred component of compensation is a motivational tool and retention mechanism for employees. Despite the decline in

[1] The terms 'termination', 'closures' and 'freezing' of defined benefit plans are used interchangeably.

[2] It should be emphasized that termination or conversion of DB plans involve significant costs for the firm. In particular, the costs associated with pension provision do not decline immediately following closures of DB plans given that contribution to DC plans will increase at the same time (Rauh and Stefanescu, 2009).

DB pension provision, the Occupational Pension Scheme Survey from the Office for National Statistics (2011) notes that there are 12.1 million members of DB pension plans in the private sector in the UK compared to 2.4 million members of Defined Contribution (DC) plans.[3] In addition, findings from a recent survey from Willis Towers Watson shows that DB plan assets represent 68% of total pension plan assets while 32% belong to DC plans. The relevant proportion in the US is 40% and 60% in DB and DC plans respectively (Willis Towers Watson, 2016).

Even though prior studies have examined the factors influencing firms' decisions to close a DB plan, there is little research on the motives underlying firms' decisions to maintain DB plans. Understanding the factors underlying plan retentions is not obvious or straightforward for several reasons. First, considering this issue from a research conceptualisation perspective, studies examining DB plan closures are motivated by the risks and subsequent costs associated with these plans. Focusing on costs does not explicitly consider benefits emanating from DB plan retention (for example attraction and retention of highly skilled employees). Second, identifying the determinants of DB plan closures does not necessarily mean that the opposite will be the case for DB plan retentions. For example, a number of studies suggest that plans with funding shortfalls are more likely to close (e.g. Munnell and Soto, 2007; Atanasova and Hrazdil, 2010). Therefore, it should be expected that plans with no shortfalls are more likely to remain open. However, this might not necessarily hold. For example, Comprix and Muller (2011) find a positive association between DB plan freezes and funding, which is defined as the ratio of the pension plan assets to the projected benefit obligation. Moreover, existing literature examines CEO incentives in the context of DB plan freezes (e.g Comprix and Muller, 2006, 2011; Bergstresser et al., 2006). As a result, they mainly focus on how CEOs are motivated from their equity-linked incentives and fail to consider executives' pension compensation incentives and subsequent DB plan retention decisions. In particular, previous literature shows that managers use their discretion in the choice of pension-plan related assumptions to show higher pension expense and pension liability to exaggerate the economic burden of pension plans and justify pension closures (e.g. Comprix and Muller, 2011) while other studies find that managers opportunistically select pension assumptions to boost income prior to undertaking

[3] These numbers refer to total members (i.e. the sum of active, deferred and pensioners). Active members were 1.9 million and 0.9 million in DB and DC plans respectively.

acquisitions and CEO option exercises and to reduce income prior to CEO option grants (Bergstresser et al. 2006). Similarly, Comprix and Muller (2006) show that managers opportunistically select pension-related assumptions to boost income when pension income is reported, in periods prior to CEOs selling shares in the open market, and when leverage is high. The above studies show that executive's pension compensation and associated retention incentives have been overlooked in the (pension) literature. Examining the factors that have an impact on DB pension provision is interesting given advantages and disadvantages associated with the sponsoring of DB pension plans from a corporate perspective as well as the importance of DB plans from a social welfare viewpoint. Hence, a study that directly addresses the reasons why companies retain DB plans is topical and likely to provide new insights. The present study examines this issue in the following ways: (a) by examining the determinants of DB plan retentions, (b) the economic consequences of DB plan retentions and (c) the determinants of pension buy-in and buy-outs.

Chapter 2 provides the background to the study and discusses DB plan characteristics and associated risks of those plans as well as well as provides an overview of the pension regulation and accounting standards for pensions.

Using hand-collected data for a sample of the FTSE All-Share UK firms sponsoring DB plans, chapter 3 provides a descriptive account of DB provision over time from 1999 to 2013 by identifying plans that are fully open, partially open and closed. Moreover in chapter 3, using a duration hazard model I empirically examine the effect that labour market incentives, managerial incentives and the adoption of FRS 17 by UK firms have on the decision to keep DB plans open. I find that firms in industries with highly skilled human capital are more likely to retain DB plans. In addition, the likelihood of DB plan survival increases when chief executive officers (CEOs) and chief financial officers (CFOs) are members of the same DB plan as the rest of the employees, irrespective of the plan funding status. On the contrary, if executives are members of an exclusive executive DB plan, they are less likely to keep main DB plans open. I do not find any evidence that the voluntary adoption of FRS 17 has any effect on DB plan retention. Moreover, the UK provides a special setting[4] to examine the effect that insider

[4] In the United States, the pension trust is fully an asset of the corporation and the directors of the sponsoring company usually make decisions regarding the pension plan (e.g., how to invest

trustees (i.e. corporate executives that are also trustees) have on DB plan retention decisions. Using a sub-sample of firms for which data on pension trustees are available, I find that CEO-trustees are more likely to positively influence the retention of DB plans, suggesting that insider-trustees have a significant impact on such decisions. This evidence supports the view that insider trustees act in the interests of pension plan members.

A question that arises is the potential implications of these results and, in particular, if there are any repercussions on shareholders and other stakeholders. Existing literature shows that DB plan freezes have an effect on stock markets and firms that terminate their DB plans exhibit positive abnormal returns (e.g. Rubin, 2007; Milevsky and Song, 2010). However, the literature does not directly address the effect of DB plan retentions which as explained above might not necessarily be the opposite. In addition, Givoly, Hayn and Katz (2016) argue that the shareholders' perception is not necessarily the same to that of bond holders. They face different risks and rewards and as such their perspectives might be different. Corporate credit ratings are important determinants of a firm's capital structure and its overall financial reputation (e.g., Sufi, 2007; Kisgen and Strahan, 2010). Therefore, in chapter 4, I examine the potential consequences of DB plan retentions and CEO membership in them on firms' credit ratings. In addition, existing literature shows that funds required for pension plans might restrict the allocation of funds for other uses (e.g. Rauh, 2006; Liu and Tonks, 2013). Another stream of literature documents the importance of DB plans as part of CEOs' compensation and how this can affect their incentives (e.g. Bebchuk and Jackson, 2005; Frydman and Jenter, 2010; Sundaram and Yermack, 2007; Cadman and Vincent, 2015). Building on this literature, I also investigate whether DB plan retentions and CEO's participation in the firm's main DB plan influences dividend policy and investment decisions given that CEOs can affect the riskiness of corporate decisions (Core, Guay and Larcker, 2003). The results show that the retention of DB plans has a negative effect on credit ratings. However, when CEO's are members of these plans, I find that credit ratings are positively affected. The latter suggests that credit rating agencies incorporate the fact that CEOs are members of these plans in their credit rating assessments. In addition,

its assets). In contrast, in the UK, trustees manage the pension plan, and they are required (in theory) to act in the interests of the plan beneficiaries. The number of the directors that also act as trustees varies among firms and this variation provides an exclusive setting to examine this issue.

this result may reflect the fact that executives that participate in DB plans are more risk averse (e.g. Sundaram and Yermack, 2007; Eisdorfer, Giaccotto and White, 2015). Therefore, they are awarded more favourable credit ratings.

In response to the challenges associated with DB plans, companies have taken significant steps to reduce the pension risk. Recently, pension de-risking strategies are gaining ground among UK's largest companies. The most common de-risking strategies involve shifts in pension assets from risky equities to bonds, pension buy-ins or buy-outs (partly or fully) and longevity swaps (Monk 2009; Blake et al., 2013). A pension buy-in is a process where the trustees buy an insurance policy to cover a group (usually pensioners) or all members. The trustees hold the policy as an asset and remain responsible for paying pension promises. On the other hand, with a pension buy-out a firm transfers all its pension assets and liabilities (usually paying a cash premium) to an insurance company which is then liable for paying pensions. In chapter 5, I provide a thorough analysis of the developments in the pension buy-in and buy-out market in the UK and compare it with the US market. In addition, I empirically examine determinants of these transactions focusing on firm and pension plan characteristics. I find that firms with large pension plans are more likely to implement a buy-in or buy-out transaction. Moreover, companies with higher funding ratios and higher profitability are more likely to implement a pension buy-in; while firms that complete buy-outs allocate less pension assets in equity investments. Even though union density is positively associated with buy-ins, it has a negative effect on the likelihood of buy-outs suggesting that unions support buy-in but not buy-out transactions possibly because buy-outs are usually followed by plan winding-ups.

1.2 Contribution

I contribute to the existing literature in several ways. First, this study contributes to the limited empirical literature on pension provision by documenting the determinants of DB plan retention in the UK context. This is the first study, to the best of my knowledge that addresses this question explicitly. As discussed above there are several reasons why an analysis of the retention is different from the analysis of DB plan closures. Given the importance of pension plans from a welfare standpoint and the magnitude of pension obligations, understanding the underlying motives for DB plan retention is of interest to regulators, shareholders,

plan members, academics and other stakeholders. Moreover, the study contributes to the newly emerging literature of risk shifting versus risk management in corporate decisions (e.g. Anantharaman and Lee, 2014) by providing evidence on the impact of CEOs and CFOs on decisions to retain DB plans in the UK. In addition, it extends prior work on DB plan corporate governance (e.g. Cocco and Volpin, 2007) and provides evidence that CEO-trustees are more likely to positively influence the retention of DB plans, suggesting that insider-trustees have an important impact on such decisions. Second, it is the first study, to the best of my knowledge, to explore the economic consequences of DB plan retentions and CEO participation in these plans on pension provision decisions as well as any credit rating effects. Credit ratings have significant effects on firms' overall financial reputation as well as capital structure. Therefore, it is essential to understand the impact that decisions related to DB plans have not only on the stock market but on credit ratings as well. Moreover, I contribute to the emerging literature on the sophistication of credit rating agencies in incorporating complex firm non-financial characteristics into their credit rating evaluation (e.g. Lee, 2008; Ashbaugh-Skaife, Collins and LaFond, 2006; Bradley and Chen, 2011; Kuang and Qin, 2013). In particular, the current study contributes to our understanding of the credit rating process from the perspective of incentives provided by managerial compensation and in particular DB pension plans. The findings also have implications on the role of accounting in restraining (or encouraging) managerial risk taking through improved disclosures on managerial compensation. Furthermore, it contributes to the emerging literature on the agency effects of inside-debt compensation by examining the importance of tax qualified DB plans and the possible repercussions that their retention has on firm's investment and dividend policies. Finally, this study contributes to the emerging literature on pension de-risking strategies by being the first study to empirically examine the firm and plan characteristics that influence such transactions. Pension de-risking strategies are considered important in protecting the sustainability of DB plans (Monk, 2009; Blake et al., 2013) and therefore understanding the determinants of these strategies is important not only for market participants to be able to make informed investment decisions, but also for policy makers to be able to make relevant adjustments which encourage such transactions. Additionally, the study extends findings of existing literature on corporate demand for hedging/insurance

(e.g. Hadlock and Pierce, 2010; Dalton and Holland, 2017) by documenting characteristics of firms that hedge against pension risk.

To summarise, the present thesis contributes to our understanding of pension provision decisions. In particular, I examine the impact of managerial incentives, existence of insider trustees and accounting standards on DB plan retentions as well as associated effects on firm credit ratings and dividend and investment decisions. In addition, I provide a rich descriptive analysis of pension buy-ins and buy-outs and their determinants.

1.3 Thesis Structure

The structure of this thesis is as follows. Chapter 2 discusses the main features of DB plans and describes developments in the legislative framework on private pension provisions as well as accounting standards on pensions in the UK in general and relevant to this study in particular. Chapter 3 examines the determinants of DB plan retentions; Chapter 4 analyses the effects that DB plan retentions and CEO participation in them has on credit ratings and other corporate decisions; Chapter 5 provides a thorough descriptive analysis of pension buy-ins and buy-outs and examines their determinants. Chapter 6 concludes and provides ideas about future research.

Chapter 2: Institutional background

2.1 Overview of defined benefit (DB) plans features.

Generally, pension plans can be classified as defined contribution (DC) or defined benefit (DB) plans.[5] In a DC plan the firm contributes a certain amount to the employee's retirement account. The firm's contribution can be based on several factors including years of service, the employee's age, compensation and profitability among others. However, the value of future benefits is uncertain. Thus, in a DC plan the employee bears the investment risk of the plan. The employer has no legal obligations beyond that of regular contributions to the plan. Contributions made by the companies at a given period to pension plans must be expensed as pension costs (see IAS 19, paragraph 43-47 for more information). If the contributions paid on the balance sheet date are higher than services already rendered, then an asset for prepaid expenses is recognized. If these contributions are not fully paid, a liability for accrued expenses is recognised.

In a DB plan, the company promises to make defined pension payments to the employee after retirement. The amount to be paid is usually based on age, years of service, and the salary levels immediately before the retirement or the average salary during their career (Glaum, 2009). The future pension payments represent a liability or obligation of the sponsoring company. Contrary to a DC plan, in a DB scheme the company bears the risk of the pension plan. Firms that sponsor DB plans are exposed to all risks associated with these schemes such as longevity risk, interest rate risk, inflation risk and investment return risk (Kiosse and Peasnell, 2009).[6] A firm that offers a DB scheme usually funds the plan by contributing assets to a separate entity, usually a trust.[7] The difference in the benefit obligation and the plan asset is known as the funded status of the plan. The latter is overfunded if the plan assets exceed the pension obligation and underfunded if the pension obligation exceeds the plan assets. In the case of funded schemes, companies set aside pension plan assets to finance future

[5] In practice pension arrangements can combine elements of DB and DC plans (cash balance or hybrid pension plans) (Wesbroom and Reay, 2005). Technically, these plans are defined benefit plans since they have an unallocated account, but they have the visibility and portability characteristics of the defined contribution plan. This type of pension plans is particularly used in US.

[6] See Table 2.1 for a description of these risks. All tables are shown at the end of each chapter.

[7] The plan assets are managed to generate the income and principal growth necessary to pay the pension benefits as they come due.

pension payments. Under IAS 19, funding shortages of a defined benefit plan will be visible on the company's balance sheet and income statement, since the company guarantees the benefits and hence funding shortages must be paid. In the case of unfunded schemes, companies must finance future pension payments from their cash flows when they are due (pay-as-you-go schemes). Regulatory requirements usually specify minimum funding levels for DB pension plans, but those requirements vary by country.[8] Accounting for defined benefit plans is considered complex mainly because of the numerous assumptions required to measure the pension obligation and expense. Specifically, the estimation of the pension obligation requires assumptions about employee turnover, length of service and rate of increase of salary levels. The length of time pension payments will be made requires demographic assumptions about employee's life expectancy. Moreover, the present value of these future payments requires assumptions about the appropriate discount rate. These assumptions can have a significant impact on the pensions provision and therefore, also on company's financial position. Billings, O'Brien, Woods and Vencappa (2016) use a sample of UK firms during 2005 to 2009 to examine the actuarial assumptions used to measure the pension obligation under IAS 19. The authors find evidence of management discretion in the selection of those assumptions, in particular, for firms that pension plan funding is weak. The authors suggest that the use of discretion reduces the representational usefulness of the reported pension figures and thus companies should be required to better justify their assumptions. Moreover, Glaum (2009) notes that differences in assumptions reduce the comparability among companies.

"Insert Table 2.1 here"

2.2 Historical developments of UK legislation on private pensions

The United Kingdom was one of the first countries to formally establish private pension systems (late 17th century) and one of the first countries to promote the funded private pension and to gradually reduce the unfunded public pension provision (Dilnot, Disney, Johnson and Whitehouse, 1994; Blake, 2003).

[8] Currently, in the UK are applied scheme specific funding requirements. Please refer to *Pensions Act 2004* for more information.

Most of the private pensions are employee sponsored plans (Blake, 2003). The recent changes in the economy and the extended life expectancies had significantly increased the cost of public pensions and spurred UK governments in the 1980s to undertake steps towards promoting privately funded pension schemes to prevent a pension crisis. This led to a rapid growth of occupational pension schemes. Currently there are over 33.5 million members participating in occupational pension schemes in the UK.[9]

During the 1980s, the UK government proposed a new pension reform legislation to encourage privately funded pensions (both occupational and personal), to reduce the public burden of unfunded social security pensions (World Bank, 1994). The Social Security Act 1986 reduced the pension benefits of the State Earnings - Related Pension Scheme ('SERPS') and encouraged individual employees to opt out of SERPS into a funded private pension system. As a result, a smaller, but growing number of individuals have been covered by individual private pension arrangements, typically known as personal pensions or stakeholder pensions since its introduction in April 1988 (Disney and Whitehouse, 1992a and 1992b). In addition, the Social Security Act 1980 linked the growth rate in pensions to the retail price index as opposed to the earnings growth that it was before to reduce the pension liability.

In December 1991, there was a public scandal about Robert Maxwell's looting of the Mirror Group pension funds. More than 18,000 Maxwell pensioners lost their pension entitlement because of his fraudulent theft of over £160 million pension assets during 1990-1991 (Blake, 2000). After this scandal significant attention was given to the lack of legislative framework governing those responsible for managing private pension funds. As a result, the government established the Pension Law Review Committee (Goode Committee) to review how to improve existing pension laws. The Goode Report, published in 1993, proposed to strengthen the legislative backing of regulations governing funded pensions and to protect pension members' rights. These proposals were codified in the Pension Act 1995. Designed to ensure the security of pension plan beneficiaries and protect their rights, the Pension Act 1995 established minimum standards for trustee fiduciary duties and pension fund reporting. The main features of the 1995 Pension Act were: i) the establishment of Occupational

[9] Office of National Statistics: Occupational Pension Schemes Survey 2015.

Pensions Regulatory Authority (OPRA) (Ch. 26, Part 1, Sec. 1-15); (ii) introduction of Minimum Funding Requirement (MFR) (Ch. 26, Part 1, Sec. 56–61) ; iii) a compensation fund for pension schemes in the event of fraud (Ch. 26, Part 1, Sec. 78-86); iv) a requirement for every pension fund to appoint an auditor and an actuary (Ch. 26, Part 1, Sec. 47-48) v) protection of existing pension scheme benefits so that they could not be reduced without member consent (Ch. 26, Part 1, Sec. 67).

In particular, OPRA had extensive powers with respect to regulating the activities of employers and trustees in relation to the pension scheme. Before the Pension Act 1995 sponsoring firms were responsible for appointing the majority of trustees (Blake, 2003). However, the 1995 Act allowed for one-third of the total number of trustees to be member-nominated trustees (MNT), with a minimum two MNTs for large plans and one if the scheme has less than 100 members. (Ch. 26, Part 1, Sec. 16-21). The Act required OPRA to monitor trustees' activities, and to state their qualifications, and specified a procedure for appointing trustees (Chapter 26, paragraphs 5-8). Moreover, the 1995 Act gave trustees among other, the responsibility for deciding on pension fund investment strategy (with the option to delegate it to a professional fund manager) and the power to defer winding up (Chapter 26, paragraphs 32-39). The trustees must set out and follow a Statement of Investment Principles (SIP) to establish the strategic objectives of the pension fund and manage conflicts between pension plan managers and members. A potential conflict may arise if sponsoring firms encourage higher risk taking in pension fund investments to reduce the amount of contributions, whereas pension members are against or tolerate less risk taking on pension fund investments (Franzen, 2010). To ensure scheme's funding adequacy the 1995 Act, introduced MFR. The MFR specifies a minimum funding level for a DB pension scheme and a schedule of necessary contributions. The statutory MFR requirement states that 'schemes must ensure that the value of the assets of the schemes is not less than the amount of the liabilities of the scheme'.[10] [11] The

[10] The detailed workings of compliance to statutory MFR requirement were set out in the Occupational Pension Schemes (Minimum Funding Requirement and Actuarial Valuations) Regulations 1996 (SI 1996/1536) and Guidance Note 27 (GN 27) from the Institute and Faculty of Actuaries.

[11] A 'serious underprovision' arises under the 1995 Act section 60(1) in the case where the scheme's assets are less than 90 percent of its liabilities. The sponsoring employers with funds falling below 90 percent of the MFR are required to increase their cash contributions to

introduction of MFR highlighted the need for trustees to consider the potential divergence between pension assets and liabilities. Until this time, the average proportion of pension assets invested in equity had increased significantly because individual fund managers were competing to beat the peer group (Blake, 2003). This strategy was successful during the equity bull market in the early nineties creating surpluses in pension schemes and allowed for contribution holidays and other improvements.

Whilst the rules on funding levels were well received, MFR was also criticized due to its failure to consider individual schemes' specific circumstances and encourage an appropriate long-term investment strategy to meet employer-specific pension commitments (Blake, 2003). In 2001, HM Treasury and Department for Work and Pensions issued the Myners Review of Institutional Investments to address the above criticism against MFR rules and its potential negative impact on pension investments. The Myners Review (2001) proposed to end the MFR and replace it with scheme-specific funding requirements. The Myners report encouraged an investment strategy that pension assets should be allocated with reference to the pension liabilities leading to a fundamental change in pension fund investment in the UK (Blake, 2003). The DB plan closures from UK firms received considerable public attention since the Myners Review report was published. In most cases, new employees were offered a defined contribution plan instead. This development, along with an ageing population and maturing workforce, imposed a strain on the occupational pension system in the UK. In December 2002, in the Green Paper, 'Simplicity, Security and Choice: Working and Saving for Retirement', it was observed that OPRA was mainly a reactive regulator, acting in response to reports of problems with pension schemes and failed to anticipate problems and intervene proactively. Therefore, it was proposed that a new, more proactive regulator be introduced. On 11th February 2004, the UK government implemented the Green paper proposals and enacted the 2004 Pensions Act (the 2004 Act). The main features of the 2004 Act involve the replacement of OPRA with the Pensions Regulator (Ch. 35, Part 1); the replacement of the Minimum Funding Requirement (MFR) with a new 'statutory funding objective' (SFO) (Ch. 35, Part 3) and the establishment of Pension Protection Fund (PPF)(Ch. 35, Part 2). Specifically, the main objectives

eliminate the deficit within one year. A five-year period was set for those falling in the region of 90 to 100 percent of the required MFR.

of the Pension Regulator are: i) to protect the benefits of members of company pension arrangements; ii) to keep claims on the PPF to a minimum and iii) to facilitate good pension scheme administration. The Statutory Funding Objective (SFO) requires that a defined benefit scheme must have sufficient assets to cover its future pension payments. If a scheme does not meet the SFO, its trustees must agree a recovery plan with the scheme's sponsor. Thus, the funding objective is specific to each individual scheme. The PPF is an insurance scheme to protect members of an insolvent employer's defined benefit scheme and all defined benefit schemes must pay a levy to the PPF. A scheme will only transfer funds to PPF if it does not have enough assets (or cash resources) to buy at least PPF levels of compensation from an insurance company.

In fact, the main features of the present UK pension regulatory framework are established with the introduction of the Pension Act 2004. The Finance Act 2004, introduced changes designed to simplify the tax regime for pensions by replacing the numerous tax regimes that were in place with a single universal regime. These changes came into effect on 6 April 2006, known as A-day.[12] Since A-day, there have been no limits on the benefits that may be provided by registered pension schemes, although adverse tax consequences arise where 'unauthorised payments' are made and where members' annual or lifetime allowances are exceeded. The 'lifetime allowance' is the maximum value of benefits an individual can have across all their registered pension arrangements without tax penalties arising.[13] The 'annual allowance' is the maximum amount by which the value of an individual's pension savings across all the registered pension schemes of which they are a member may increase in any given period, known as the pension input period, without tax penalties arising.[14] The Finance Act 2011 introduced further changes to the tax regime for pensions of which the most important were the reduction of the lifetime and annual allowances which were further reduced with the Finance Act 2016.[15] Moreover, The Pension Act

[12] See Chapter 4 of Finance Act 2004.
[13] The lifetime allowance for the tax-year 2006-07 was £1.5 million and went up to £1.8million for the tax year 2010-11 when the tax regulation changed. Any amounts in excess of the lifetime allowance are subject to a tax charge of 25% (on top of the income tax) if the benefits are paid as a pension and 55% if they are paid as lump sum.
[14] The annual allowance for the tax year 2006-07 was £250,000 and went up to £255,000 for the tax year 2010-11 when the tax regulation changed.
[15] Annual allowance was reduced from £255,000 in the tax year 2010-11 to £50,000 from 2011-12 onwards and to £40,000 from April 2016; while lifetime allowance was reduced from £1.8 million to £1.5 million from April 2012 and £1m from April 2016.

2014 gave more power to the PPF to request pension levies in respect of past periods and to restructure the compensation cap to better protect long service members. Furthermore, The Pension Act 2015 introduced the shared-risk schemes (or defined ambition schemes) (Ch. 8, part 1) and collective benefits (Ch. 8, Part 2). Shared- risk schemes offer a pension promise about some of the benefits of scheme, but not for all. Collective benefits are provided by allowing pension plans to be run in a way that shares risks among members by pooling their assets. This means that when a member retires, they can receive an income from the shared assets of the scheme. The purpose of those measures is to enable better risk sharing among firms, plan members and third parties and as a result to reduce the burdens that final salary plans pose to employers. Amendments in pension legislation had a direct impact on how firms account for DB pensions during my sample period. Moreover, changes in annual and lifetime allowances are important factors in shaping executives' incentives related to DB plans. Tables 2.2[16] and 2.3 present an overview of the changes in the pension legislation in the UK and the changes in the lifetime allowance and annual allowance.

"Insert Table 2.2 here"

"Insert Table 2.3 here"

2.3 Accounting standards on pensions

Until 1988 there was no real distinction was made between the accounting for DB and DC schemes in the UK (Blake, Cairns and Dowd, 2008). Both schemes were accounted for mainly on pay- as- you- go (PAYG)[17] contribution basis.[18] This changed with the introduction of Statement of Standard Accounting Practice 24 (SSAP 24) by the Accounting Standards Committee (ASC) (Kiosse and Peasnell, 2009). SSAP 24 provided the first attempt in the UK accounting to standardise the calculation of pension costs and the disclosure of information

[16] Tables are shown at the end of each Chapter.

[17] PAYG schemes are unfunded pension schemes. The sponsor accepts the liability to provide retirement benefits to participants but does not set aside provisions to meet future obligations. The PAYG structure is based on a philosophy of "intergenerational solidarity" where today's workers support older workers.

[18] This means that before 1988 DB and DC schemes were treated as public pension schemes for accounting purposes.

related to this calculation, particularly to DB pension schemes (Sweeting, 2010).[19] It went into effect from periods ending on or after 1 July 1988 and remained in force until the introduction of Financial Reporting Standard 17 (FRS 17) and IAS 19 in 2005. Although, SSAP 24 introduced some level of standardisation, it still left considerable scope for discretion in the choice of assumptions, making comparisons difficult (Kiosse and Peasnell, 2009). In particular, SSAP 24 permitted UK companies that sponsored DB schemes substantial flexibility in the choice of actuarial valuation methods, valuation frequency (minimum once every three years), and the discount rate used to calculate the pension liabilities (Sweeting, 2010).

The UK adopted a system of fair value accounting with the introduction of FRS 17 in November 2000.[20] FRS 17 introduced essential changes in accounting for DB pension schemes. UK firms had to recognise their pension plan surpluses or deficits as an asset or liability on their balance sheets measured annually to market values (FRS 17, paragraphs 37-74). Also, any actuarial gains and losses[21] were recorded in the statement of total recognised gains and losses (STRGL) (FRS17, paragraphs 57-59). To assess the expected effect of the changes that the new standard brought on Kiosse and Peasnell (2009) analyse the relevant aspects of responses received by the Accounting Standards Board (ASB) to the proposals included in exposure draft FRED 20 on pension accounting. The authors conclude that many respondents were concerned that the proposals would lead to the termination of DB plans. This concern was shared across other groups such as the Institute and Faculty of Actuaries, the National Association of Pension Funds, the Pension Management Institute and other accounting and actuarial consulting firms. The main reason underlying this concern was that FRS17 would increase the volatility of pension costs by requiring immediate recognition in the profit and loss statement with corresponding large fluctuations on the balance sheet because of the

[19] Proposals had previously been set out in two Exposure Drafts (ED), ED 32 (1983) and ED 39 (1986). Despite their limited scope the EDs raised issues around both disclosure and recognition of pension schemes in corporate accounts.

[20] FRS 17 was introduced in 2000 but it only had to be implemented in stages between June 2001 and June 2003. However, full FRS 17 implementation was delayed until 2005 in order to reduce the costs associated with the implementation of two accounting standards during a short time period (Kiosse and Peasnell, 2009).

[21] Actuarial gain or loss refers to an increase or decrease to a company's estimate of the Present Value of Obligation (PBO) or the Fair Value of Plan Assets (FVPA) as a result of either change in assumption or experience adjustments / variance. (See IAS 19 (para. 7) for a full definition).

requirement to recognise pension surpluses and deficits of the sponsoring company.

With Regulation EC 1606/2002 the European Parliament and Council decided that all publicly traded companies should apply the International Financial Reporting Standards (IFRS) in the preparation and presentation of consolidated accounts for the periods beginning on or after 1 January 2005. Under IFRS, the accounting standard concerning employee benefits is IAS 19. FRS 17 and IAS 19 are similar in their rules regarding measurement and disclosure of retirement benefits, but there are some differences in the recognition of actuarial gains and losses and the presentation of items in the financial statements. Both standards require that defined benefit scheme assets and liabilities are valued at each balance sheet date to produce an asset or liability for recognition on the balance sheet. All the items recognised in the profit and loss account under FRS17 are treated in a similar way under IAS 19. However, for actuarial gains and losses that are recognised immediately in the statement of total recognised gains and losses (STRGL)[22] under FRS17, there are three options under IAS 19: i) full recognition through the Statement of Recognised Income and Expense (SORIE) (i.e. through shareholders' equity; similar to the treatment under FRS 17); ii) full recognition through Profit & Loss (P&L), or iii) the 'standard' corridor approach[23] according to which firms can defer the recognition of actuarial gains and losses. Immediate recognition of these gains and losses, as opposed to smoothing their impact via the corridor approach, can yield significant volatility in equity and the STRGL (Fasshauer, Glaum and Street, 2008). In addition, it has been shown that some European companies achieved material off-balance sheet financing by using the corridor method (Fasshauer, Glaum and Street, 2008). To address this issue the International Accounting Standards Board (IASB) introduced in 2004, as an option, the equity method where actuarial gains and losses are immediately recognised in Other Comprehensive income (OCI). The equity method became mandatory in 2011,

[22] STRGL is a primary financial statement that includes the profit or loss for the period together with all movements in reserves reflecting recognised gains and losses attributable to shareholders.

[23] Under the corridor rule if the gain or loss exceeds 10% of the greater of the Pension Benefit Obligation (PBO) or the fair value of plan assets actuarial gain or loss can be amortized gradually over time into the income statement. For financial reporting periods beginning on or after 1st January 2013 the 'corridor method' option is removed.

and firms had to apply it no later than 1 January 2013. Glaum, Keller and Street (2017) examine the determinants of the voluntary adoption of the equity method for a sample of firms from France, Germany and the UK during 2005 to 2013. The authors note that UK firms adopted the equity method since 2005 while only a small number of French and German firms selected this method. The authors find that the voluntarily adoption of the equity method is primarily driven by short-term effects on equity suggesting that the accounting choice was used opportunistically especially in 2005.

The revised version of IAS 19, IAS 19(R), effective for fiscal years beginning on January 2013, recently replaced IAS 19. IAS 19(R) introduced significant changes to accounting for actuarial gains or losses and pension expenses. First, as mentioned earlier, firms can no longer defer the recognition of actuarial gains or losses by using the corridor approach; rather they have to recognise actuarial gains or losses immediately in other comprehensive income (OCI). Although, actual economic exposure is not affected this increases the volatility in the statement of financial position (KPMG, 2013). However, Fasshauer, Glaum and Street (2008) argue that this would enhance international comparability and assist the convergence with US GAAP. Second, IAS 19(R) no longer allows the use of expected rates of return (ERR) when calculating the pension expense to be recognised in profit or loss and firms will have to apply the discount rate on the net pension asset or liability. Thus, companies will have to use the discount rate used to calculate the present value of the pension obligations when computing return on pension plan assets. This change is likely to increase the reported pension expense. It should be noted that SSAP 24, FRS 17 and IAS 19 are the accounting standards followed by firms in my sample in chapters 3 and 4; While, IAS 19R only applies to the sample of firms in chapter 5 where I extend the sample period beyond 2013. Table 2.4 summarises the main features of the pension accounting standards SSAP 24, FRS 17 and IAS 19.

"Insert Table 2.4 here"

Appendix I

Table 2.1: Description of DB plan risks

Risk type	Definition
Longevity risk	The risk that employees will, on average, live longer than expected.
Interest rate risk	The risk that interest rates will fall and the burden of long-dated liabilities will increase accordingly.
Inflation risk	The risk that final salaries will increase at a rate greater than expected.
Investment risk (equity or credit risk)	The risk that the returns on the pension plan assets investments will under-perform or that a bond in the pension assets portfolio might default.
Operational risk	The risk that an unexpected need for higher contributions can divert cash from main business activities.

Notes: Table 2.1 summarises the main risks faced by firms that sponsor DB plans.

Table 2.2: Overview of pension legislation changes (1995- 2016)

Year	Legislation	Description
1995	Pension Act 2005	Introduced stronger regulatory framework. Established minimum standards for trustee fiduciary duties and pension fund reporting.
1999	Welfare Reform and Pensions Act	Introduced stakeholder pensions.
2000	Child Support, Pensions and Social Security Act	Replaced SERPS with State Second Pension (S2P).
2002	State Pension Credit Act	Guaranteed minimum income with tapered benefit for all over-60s.
2004	Finance Act	Simplified tax regime for pensions. Introduced Lifetime allowance and Annual allowance.
2004	Pensions Act	Reformed pensions' regulatory system. Establishment of the Pension Regulator, Statutory Funding Requirement and Pension Protection Fund.
2006	The Employment Equality (Age) Regulations	Prohibited unjustified direct and indirect age discrimination.
2007	Pensions Act	Statutory Pension Age (SPA) for men and women to increase from 65 to 68 from 2024. Reformed the Basic State Pension and S2P.
2008	Pensions Act	Workplace pension reform, including auto-enrolment and compulsory employer contributions for most employees.
2011	Finance Act	Changed rules on annual and lifetime allowances, annuities and income drawdown.
2011	Pensions Bill	Amendments to workplace pension reform (Pensions Act 2008). SPA for men and women to increase to 66 by 2020.
2014	Pension Act	Increased powers to PPF. Replacement of the basic state pension with the single-tier pension.

2015	Pension Act 2015	Introduction of shared-risk schemes and collective benefits.
2016	Finance Act 2016	Changed rules on annual and lifetime allowances.

Sources: Office for National Statistics (2011) and author's own research.

Notes: Table 2.2 summarises the most important pension legislation changes in the UK for the period 1995 until 2016.

Table 2.3: Changes in the lifetime and annual allowances (2006-2017)

Financial Year	Lifetime Allowance (in £ millions)	Annual Allowance (in £ thousands)
2006/07	1.5	215
2007/08	1.6	225
2008/09	1.65	235
2009/10	1.75	245
2010/11	1.8	255
2011/12	1.8	40
2012/13 and 2013/14	1.5	40
2014/15 and 2015/16	1.25	40
2016/17 and 2017/18	1	40

Notes: Table 2.3 shows the changes in the lifetime allowance and annual allowance for pension benefits in the UK from 2006 when they were initially introduced until present.

Table 2.4: Comparison of accounting standards SSAP24, FRS17, IAS 19 and IAS 19R

	SSAP24	FRS17	IAS19	IAS 19R
General approach	Profit and Loss (P&L) driven	Balance sheet driven	Balance sheet driven	Same
Rights of assumptions	Actuary	Employer on actuary's advice	Employer (actuarial advice recommended)	Same
Measurement frequency	At least triennial	Annual update but without annual valuations	Annual	Same
Actuarial method	Not specified	Projected unit method	Projected unit method	Same
Asset valuation	Actuarial value	Market value (no smoothing)	Market value (no smoothing)	Same
Discount rate assumption	Actuary's best estimation over the long-term equity return	High quality (AA or equivalent) corporate bond yield	High quality corporate bonds yield	Same
Expected rate of return on assets	NA	Long term expected return for each asset class	Long term expected return for all assets	No distinction between the discount rate and expected rate of return on assets
Recognition of actuarial gains and losses	Spread over working lifetime in P&L	Immediate recognition in balance sheet via statement of recognised gains and losses; no effect on P&L	Immediate recognition in P&L or deferred via the corridor approach. An alternative treatment is immediate recognition in Other Comprehensive Income (OCI)	Immediate recognition in OCI

Notes: Table 2.4 provides a comparison of the pension accounting standards in the UK, namely, SSAP24, FRS17 and IAS19.

Chapter 3: Defined Benefit Plan Retentions

3.1 Introduction

This Chapter examines the determinants of DB pension plan provision in the UK. Given that life expectancies have significantly risen and the related on-going concern of the welfare of retirees, addressing the issue of retirement funding in the UK and elsewhere has never been so important. In the UK and elsewhere employer sponsored pension schemes are vital sources of retirement income (Kiosse and Peasnell, 2009).

Historically, most companies commonly offered final salary pension schemes that provided employees with income security after retirement (Yermo and Severinson, 2010). More recently, the costs of these schemes have risen significantly, owing primarily to new and increased levels of regulation coupled with changes in demographic and economic environments (Yermo and Severinson, 2010; Kiosse and Peasnell, 2009). This has ultimately led to the reduction in the benefits provided to new and/or existing members and DB plans have even been closed during the last three decades (Munnell, 2006; Glaum, 2009; Kiosse and Peasnell, 2009). Evidently, a survey from the National Association of Pension Funds (NAPF) illustrates that, in the UK in 2012, only 13 percent of DB plans were open to new entrants, which is a sharp fall compared to 2005, when 43 percent of pension plans were open. In addition, the number of firms that closed DB plans for existing members climbed to 31 percent in 2012 compared to 23 percent in 2011 (NAPF, 2013). The prior literature examines the motives behind pension benefits reductions or terminations of DB pension plans. Hamdallah and Ruland (1986) examine the motives underlying the termination of overfunded pension plans by comparing a sample of firms that terminate their DB pension plans to a sample of firms which continue sponsoring overfunded pension plans. The results suggest that firms are more likely to terminate overfunded pension plans when union employees are not members of the plan; in addition, firms which terminate their plans are more likely to have managerial compensation plans tied to income-related numbers as well as high owner control. Hence, these findings emphasize the importance of management incentives underlying the decision to terminate overfunded pension plans. Further, Thomas (1989) finds that cash needs are the main reason of overfunded plan terminations as opposed to tax implications, accounting or wealth transfer,

while Petersen (1992) finds that avoidance of future obligations explains the termination decision.

The economics of DB plans have changed significantly over the recent years. The strict regulation as well as recent developments in the financial markets has resulted in severely underfunded DB plans (Munnell and Soto, 2007). More recent studies on DB plan terminations explore the potential effect of accounting reforms (e.g., Beaudoin, Chandar and Werner, 2010) along with firm and pension plan characteristics on the decision to terminate a DB plan (e.g., Munnell and Soto, 2007; Comprix and Muller, 2011), while others consider the role of changes in labour characteristics and preferences (e.g., Cowan and Power, 2003; Coronado and Copeland, 2004; Aaronson and Coronado, 2005; Kapinos, 2012; D'Souza, et al., 2013).

Aside from the benefits arising from the cessation or conversion of DB pension plans,[24] they still constitute an important component of the compensation package. This deferred component of compensation is used as a motivational tool and retention mechanism for employees. Despite the decline in DB pension provision, the Occupational Pension Scheme Survey from The Office of National Statistics (2011) notes that, in the UK, there are 12.1 million members of DB pension plans in the private sector compared to 2.4 million members of DC plans.[25]

Firms that retain their DB plans can keep the plan open to all employees (i.e. existing and new employees) or reduce the accrual of future benefits either to all employees or to new employees only by offering for example, career average rather than final salary schemes.[26] Even though prior studies have examined the factors influencing firms' decisions to close a DB plan, there is little research on the motives underlying firms' decisions to maintain DB plans. Such effect is not obvious or straightforward for several reasons. First, considering this issue from a research conceptualisation perspective, studies examining DB plan closures are motivated by the risks and subsequent costs associated with these plans.

[24] It should be emphasized that termination or conversion of DB plans involve significant costs for the firm. In particular, the costs associated with pension provision do not decline immediately following closures of DB plans given that contribution to DC plans will increase at the same time (Rauh and Stefanescu, 2009).

[25] These numbers refer to total members (i.e. the sum of active, deferred and pensioners). Active members were 1.9 million and 0.9 million in DB and DC plans respectively.

[26] For the remainder of the paper I refer to plans that are closed only to new entrants as partly open/closed plans and to plans that are closed/open to both existing and new members as fully closed/open plans.

Focusing on costs does not explicitly consider benefits emanating from DB plan retention (for example attraction and retention of highly skilled employees). Second, identifying the determinants of DB plan closures does not necessarily mean that the opposite will be the case for DB plan retentions. For example, several studies suggest that plans with funding shortfalls are more likely to close (e.g. Munnell and Soto, 2007; Atanasova and Hrazdil, 2010). Therefore, it should be expected that plans with no shortfalls are more likely to remain open. However, this might not necessarily hold. For example, Comprix and Muller (2011) find a positive association between DB plan freezes and funding, which they define as the ratio of the pension plan assets to the projected benefit obligation. Moreover, existing literature examines CEO incentives in the context of DB plan freezes (e.g Comprix and Muller, 2006, 2011; Bergstresser et al., 2006). As a result, they mainly focus on how CEOs are motivated from their equity-linked incentives and fail to consider executives' pension compensation incentives and subsequent DB plan retention decisions. In particular, previous literature shows that managers use their discretion in the choice of pension-plan related assumptions to show higher pension expense and pension liability to exaggerate the economic burden of pension plans and justify pension closures (e.g. Comprix and Muller, 2011) while other studies find that managers opportunistically select pension assumptions to boost income prior to undertaking acquisitions and CEO option exercises and to reduce income prior to CEO option grants (Bergstresser et al. 2006). Similarly, Comprix and Muller (2006) show that managers opportunistically select pension related assumptions to boost income when pension income is reported, in periods prior to CEOs selling shares in the open market, and when leverage is high. The above studies show that executive's pension compensation and associated retention incentives have been overlooked in the (pension) literature. Examining the factors that have an impact on DB pension retention is interesting given advantages and disadvantages associated with the sponsoring of DB pension plans from a corporate perspective as well as the importance of DB plans from a social welfare viewpoint. Hence a study that directly addresses the reasons why companies retain DB plans is topical and likely to provide new insights.

Using hand-collected data for a sample of the FTSE All-Share UK firms sponsoring DB plans, this study provides a descriptive account of DB provision

over time from 1999 to 2013 by identifying plans that are fully open, partially open and closed. In addition, I examine the determinants of DB plan retentions. In particular, I initially examine the role of labour market incentives on the decision to retain DB pension plans. I expect that firms for which human capital is an important resource are more likely to retain their DB plans. In addition, building on the growing literature discussing the importance of key executives on corporate decisions, I examine the role that managerial incentives play on pension provision decisions. In this context, I examine the impact of CEO / CFO participation in the main DB plan on the same terms as the rest of the employees on the likelihood of retaining the DB plans. In this case, I would expect the CEO / CFO to have incentives to retain the DB plan. However, executives are sometimes members of a preferential executive DB pension plan exclusive to executives only; in this case, I would not expect incentives to retain DB plans to be equally as strong. However, I do not have any predictions about the impact of managerial membership in an executive pension plan on the decision to retain the main DB plan. Finally, drawing on the literature examining the impact of accounting rule changes, I explore the potential role of FRS17 on the decision to retain DB plans by examining the voluntary adoption of FRS17 by firms included in our sample. Firms choosing to voluntarily adopt FRS17 may do so to signal their transparency to the market and to portray the financial position of pension plans in the accounts accurately. On the other hand, comment letters submitted by companies to the Exposure Draft leading to the introduction of FRS17 noted that FRS17 may contribute to the demise of DB plans. Hence, it is possible that some of the firms that voluntarily adopted FRS17 did so to legitimize the reduction in the accrual of benefits or even the closure of DB plans. The underlying incentives are not clear, and this is ultimately an empirical question to which I seek to shed more light.

Using a duration hazard research design which models the cause-specific hazards of closure, for a sample of FTSE All-Share firms during 1999-2013, I find that firms where the CEO and CFO participate in the main DB pension plan as the rest of the employees as well as firms where human capital is important are more likely to retain their pension plans, despite whether the plan is underfunded or not. Moreover, I do not find any evidence that voluntary adoption of FRS17 influences DB plan retention. However, when this is combined with CEO/CFO pension plan incentives, I that firms that voluntarily adopted FRS17 and their

CEOs/CFOs have executive pension plans then these firms are less likely to keep DB plans partly open. Overall, these results suggest that DB plans are an important retention tool consistent with the labour economics literature. In addition, CEO and CFO incentives play an important role in DB plan retention decisions.

In the UK, DB plans are set up in trusts and trustees are responsible for decisions such as the closure of DB plans (The Pensions Regulator, 2014). The presence of company executives on the board of trustees possibly allows the firm to exert more control over decisions related to the plan than would be the case if the board of trustees consisted of independent trustees only (Cocco and Volpin, 2007). Using a subsample for which trustee data are available, I examine the role of insider trustees, which I define as trustees that are also company executives, on the firm's decision to keep DB plans open. In this context, the extent to which the incentives of insider trustees are aligned with plan members' interests or shareholders' incentives is examined. I find that controlling for the presence of insider trustees, CEOs who are members of the main DB plan are more likely to keep this plan open. On the contrary, I do not find such evidence for CFO trustees which suggests that CEOs have the overall responsibility in such decisions.

The study contributes to the existing literature in several ways. First, this study contributes to the limited empirical literature on pension provision by documenting the determinants of DB plan retention in the UK context. This is the first study, to the best of my knowledge that addresses this question explicitly. While previous studies have examined the motives underlying pension terminations (e.g.,Hamdallah and Ruland, 1986; Munnell and Soto, 2007; Comprix and Muller, 2011), no studies have examined the reasons why some firms decide to retain their DB plans and it is not straightforward to infer this from studies focusing on DB plan closures. Understanding why some firms continue to sponsor DB plans is of interest to regulators, shareholders, plan members, academics and other stakeholders given the importance of pensions for retirement security as well as the magnitude of pension obligations.[27] Second, recent US studies (e.g., Anantharaman and Lee, 2014) find that managerial incentives influence the extent of risk shifting versus risk management of DB pension plans and that executives' stake, in particular CFOs, in DB plans is the

[27] In 2013, the DB plan deficit for the FTSE 100 companies was £43 billion; in particular, liabilities were equal to £490 billion and assets were equal to £447 billion (LCP, 2013).

main driver of DB plan funding. I build on this stream of research by documenting the impact of CEOs and CFOs on decisions to retain DB plans in the UK. In addition, I extend prior work on DB plan governance (e.g., Cocco and Volpin, 2007) by examining the impact of insider trustees. In particular, I find that CEO-trustees are more likely to positively influence the retention of DB plans, suggesting that insider-trustees have a significant impact on such decisions. Further, this chapter contributes to the emerging literature of CEO versus CFO role in corporate decisions (Anantharaman and Lee, 2014; Chava and Purnanandam, 2010; Jiang, Petroni, and Wang, 2010; Kim, Li, and Zhang, 2011) by documenting the key role that CEOs play in the decision to retain DB plans. Finally, I contribute to the literature (e.g., Beaudoin, Chandar and Werner, 2010) analysing the potential impact of new accounting standards on pension provision by examining the effect that the adoption of FRS17 has on DB plan retentions.

The remainder of the chapter is organised as follows; Section 3.2 provides a review of relevant literature and develops the hypotheses to be tested in this study. Section 3.3 discusses the research design and Section 3.4 discusses sample selection and descriptive statistics. Section 3.5 discusses the findings and Section 3.6 provides additional analysis on the role of insider trustees. Section 3.7 concludes.

3.2 Literature review and hypotheses development

There are four streams of literature relevant to this study. The first is the labour economics literature discussing the role of DB plans; the second refers to studies that examine the importance of executive pensions and their impact on management incentives; the third refers to studies that examine the effect of changes in accounting standards on pension provision decisions; finally, the fourth refers to studies that examine the closure of DB plans. The following subsections discuss each stream of the literature and develop the hypotheses to be tested in this chapter.

3.2.1 Labour market incentives

A significant body of literature on labour economics examines why companies offer pension plans and in particular DB plans. Occupational pensions generally represent a significant part of employee compensation and can be

viewed as deferred remuneration accepted by employees as an alternative to additional cash wages or fringe benefits such as health insurance (Stone, 1987). In addition, the existence of DB plans encourages the employee-firm bonding because if employees decide to leave the company voluntarily they will have to bear a high opportunity cost such as lost retirement benefits (Lazear, 1979, 1981). Hence, turnover cost is predicted to decline and productivity to rise in the presence of a DB plan (Salop and Salop, 1976; Blinder, 1982; Lazear, 1981).[28] Further, DB plans enable employers to develop firm-specific human capital (Blinder, 1982). Assuming a rational labour market, this suggests that when firms provide a generous pension scheme, this will positively affect a firm's ability to attract and retain high quality employees (Ippolito, 1985). This view is also supported by recent surveys in both the UK and the US on pension preferences, which document that DB plans have stronger employee attraction and retention effects (Confederation of British Industry (CBI), 2013; Towers Watson, 2014).

The cost of providing DB plans has increased significantly, which influences the sustainability of DB plans (Kiosse and Peasnell, 2009) and hence cost saving incentives may prevail for some firms when considering DB pension provision (Rauh, Stefanescu and Zeldes, 2013). However, human resource requirements differ across firms. In particular, for some firms it may be more important to employ high-calibre employees and reduce employee turnover compared to other firms. Companies that face large up-front costs when hiring and training employees or firms where productivity is enhanced by retaining a loyal employee base will be more likely to provide employees with a competitive deferred compensation package (Clark and Quinn, 1999; Coronado and Copeland, 2004). Given the above reasoning, I argue that firms for which human capital is relatively more important are more likely to design compensation policies with a view to attracting and retaining high calibre employees; I therefore expect that such firms are more likely to keep their DB plans open. The above discussion leads to the first hypothesis:

H_1: Firms for which human capital is important are more likely to retain their DB plans, all else equal.

[28] See Ippolito (1997) for a thorough discussion on how DB plans can be used as natural mechanisms to increase productivity and reduce turnover.

3.2.2 Executive pensions

DB pension plans are considered a form of inside debt[29] and similarly to other forms of debt, inside debt obligations expose managers to default risk (Edmans and Liu, 2011). Inside debt compensation represents a potential way to reduce the agency costs of debt, which may arise when managers change the firm's capital structure, investment policy or capital ratio in order to re-allocate wealth from debtholders to shareholders (Jensen and Meckling, 1976). They suggest that for an optimal incentive structure, management's personal holdings in debt and equity should be in line with the firm's overall external capital structure. If this is not the case then it is possible for excessive inside debt to prompt executives to make more conservative decisions, reduce the overall risk and restrain liquidity, thereby transferring wealth from shareholders to debtholders. This argument has gained more prominence in the current financial environment as many firms seek to reduce their managers' risk-taking behaviour (Wei and Yermack, 2011). In line with these arguments, several studies find that DB pensions play a significant role in the compensation of US executives. For example, Bebchuk and Jackson (2005) calculate the pension values for 51 existing and recently retired CEOs of S&P 500 companies and conclude that pensions represent a significant component of CEOs' compensation; in particular, the sample of CEOs examined are entitled to pension benefits of over $800 million. In addition, the prior literature finds that firms make higher contributions when highly paid executives are members of the plan (Wilkie, 1988).

I build on this literature and explore the impact of management participation in the company's DB plan on the decision to retain DB plans. This decision may be influenced by managers' participation in the same scheme as the rest of the employees or alternatively by whether they are members of a separate exclusive executive scheme.[30] If managers are rational utility

[29] They basically represent fixed obligations to be paid to company insiders (employees).
[30] Following implementation of the regulations contained within the Finance Act 1989, UK companies had to adopt the Statutory Earnings Cap with regards to pensionable salaries; thus, Executive Directors will be eligible to receive the maximum pension that can be provided from the registered pension scheme and for the part of the pensionable salary above the cap any pension entitlement is delivered through an unapproved retirement benefits scheme (URBS), which may be funded or unfunded. In the present study, I do not refer to these unapproved schemes, but rather to separate qualified DB plans established specifically for the executives of the firm. Recently URBS are replaced by Employer- Financed Retirement Benefit Schemes (EFRBS or EFURB).

maximizing individuals, then it is in their own interest not to close the DB scheme if they are members of the firms' main DB plan provided to the rest of the employees. The above discussion suggests that firms with management membership in the main DB plan, as the rest of the employees, are more likely to keep their DB plans open, all else equal. On the other hand, if executives have a separate DB scheme from the rest of the employees then their incentives may be different. In particular, they may not have a vested interest to fully fund and keep the main DB scheme open. However, some companies may believe that deferred compensation components such as pensions are important and may therefore be more inclined to retain DB plans for both existing and new employees irrespective of whether managers are members of the company's DB plan. Even though it is not clear which effect will predominate, the above reasoning suggests that participation of executives in a separate DB plan will affect a firm's decision to retain their DB plans, all else equal.

Although, corporate decisions are often made in teams (Aggarwal and Samwick, 2003), the previous literature has highlighted the important role of CEOs on corporate decisions and policies (e.g., Berger, Ofek, and Yermack, 1997; Schrand and Unal, 1998; Rogers, 2002; Dennis and Mihov, 2003; Chava and Purnanandam, 2010; Graham, Harvey and Puri, 2013). Sundaram and Yermack (2007) find that debt incentives are a more important component of CEO compensation as CEOs get older and that in those cases CEOs pursue more conservative strategies to reduce the overall risk of the firm. In addition, their results suggest that at any given age, the CEO is more likely to retire voluntarily if their pension benefits have vested and are payable immediately. When CEOs continue working after the minimum retirement age, their cash compensation is higher. Moreover, Wei and Yermack (2011) examine investor reactions to CEO's initial reports of inside debt positions required by SEC reforms in 2007. They find that firms whose CEOs have large DB plans or deferred compensation, stock prices fall, bond prices rise and the volatility of both bonds and equities drops when this information was reported after the SEC disclosure reform in 2007. Their results imply a reduction in overall firm risk and a transfer of value from equity holders to debtholders when executives' holdings of inside debt are large. The study by Begley et al. (2015), which is the one more closely related to mine, examines whether the CEO's compensation package influences the funding

levels of a firm's tax-qualified DB plan and they find that CEOs with greater interests in supplemental pension plans are more likely to underfund the company's DB plan.

Furthermore, the role of chief financial officers (CFOs) on corporate decisions has only recently started to gain prominence and several studies document the effect of CFO incentives with regards to corporate and financial decisions (e.g., Chava and Purnanandam, 2010; Anantharaman and Lee, 2014). Building on this literature, I examine the influence of both CEO and CFO participation in the firms' main pension plan, as opposed to a separate executive plan, on the survival rate of DB plans. In this context, I would expect the CEO and CFO incentives related to the decision to retain a firm's DB plan to be more important compared to the executive directors in general. Anantharaman and Lee (2014) find that pension funding is stronger and that the positive relationship between firm risk and underfunding is lower when top managers, CEOs and CFOs in particular, have a significant vested interest in the pension plan and which may be jeopardized if the plan proves to be unsustainable. Based on the above discussion, I expect CEOs and CFOs who are members of the firms' main DB plan to be more likely to retain the main DB plan. This leads to the second sub-hypothesis:

H_{2A}: Firms with CEO (CFO) membership in the firm's DB plan on the same terms as the rest of the employees are more likely to keep their DB plans open, all else equal.

On the other hand, if CEOs/CFOs have a separate DB scheme from the rest of the employees then their incentives may be different. However, I do not have any strong predictions about the impact of CEO/CFO membership in an exclusive executive pension plan on the decision to retain the main DB plan. This leads to the following non-directional sub-hypothesis:

H_{2B}: Participation of CEO (CFO) in a separate DB plan will affect a firm's decision to retain DB plans, all else equal.

At this point it is important to distinguish my expectations based on whether the hazard is a part or full closure of the plan. If the plan is fully closed, the expected effect on the executives' pension are straightforward; they will

normally be worse off since they lose their vested interest. On the contrary, if the firm's pension plan is partly closed the direct effects on the CEO (CFO) plan are not clear. If there are further curtailments followed by the partial plan closure then executives will be worse off; on the other hand, if the closure of the plan to new members does not have any subsequent effects on existing members, then an executive being a member of this plan will not make any difference to the decision to close/retain the DB plan.

3.2.3 Accounting standards

Historically, there was no accounting standard governing pension accounting in the UK until 1988 when SSAP 24 was introduced. SSAP 24, which was based on actuarial calculations, was superseded by FRS 17 in November 2001, a standard that introduced fundamental changes to pension accounting. The adoption of FRS 17 was postponed until June 2003 and then again until January 2005 to coincide with the introduction of IAS 19, thereby reducing the cost for companies of having to implement two accounting standards. Up until this time, companies were required to disclose pension information under FRS17 in the footnotes and were encouraged, but not required, to adopt or fully implement FRS17. Studies examining the impact of pension accounting standards on pension provision are few. Klumpes, Whittington and Li (2009) examine the characteristics of firms that exercised discretion over expected rate of return assumptions and which curtailed their DB plans. Using an industry matched sample of 40 UK companies that used mark-to-market expected rate of return (ERR) assumptions, consistent with the requirements under FRS 17, and 40 non-switching industry-matched firms, Klumpes et al. (2009) find that firms that curtailed their DB plans and which frequently changed their ERR assumptions had significantly lower funding ratios, higher pension expenses and higher rates of undertaking new investments before the curtailment of the plan compared to those that kept the DB scheme open. Further results suggest that companies, which did not engage in active risk management of their DB plans in light of regulatory and economic changes, curtailed their DB plans and engaged in other corporate restructuring activities.

Beaudoin et al. (2010) examine the potential impact of the anticipated adoption of Statement of Financial Accounting Standards (SFAS) No. 158 in the

US in September of 2006. They compare a sample of 147 firms which decided to freeze their DB plans with a matched sample of firms that did not freeze their DB plans. The results provide strong support for the hypothesized impact of SFAS No. 158 on firm decisions to freeze their DB plans. Amir, Guan and Oswald (2010) examine the impact of changes in pension disclosure and recognition requirements under FRS17 in the UK and SFAS 158 in the US on pension asset allocation decisions. The new standards were expected to introduce volatility on reported numbers. By identifying a disclosure and a full recognition period, Amir et al. (2010) find that UK firms changed their pension asset allocation from equities to bonds during both periods. A shift from equities to bonds was also documented for US firms around the adoption of SFAS 158. The authors conclude that these results can be partly explained by the anticipated impact of the new accounting standards.

Building on the prior literature, which documents the impact of accounting standards on pension freezes in the US and on asset allocation decisions for UK firms, I examine the impact of pension accounting standards on the decision to retain DB plans by focusing on the voluntary adoption of FRS 17 by firms included in my sample. The incentives driving the voluntary adoption of FRS 17 can be either characterized as altruistic or strategic. On the one hand, firms choosing to voluntarily adopt FRS 17 fully by recognizing the required amounts in the financial statements may do so to signal their transparency to the market and to portray the financial position of pension plans in the accounts accurately (i.e., altruistic FRS17 adopters). On the other hand, some firms which voluntarily adopted FRS17 may be motivated by strategic incentives. Comment letters submitted by companies to the Exposure Draft leading to the introduction of FRS17 alleged that FRS17 may contribute to the closure of DB plans. The above suggest that it is possible that some of the firms that adopted FRS17 voluntarily did so to 'use' the impact of the accounting rule changes on reported numbers as an excuse to legitimize the reduction in the accrual of benefits or even the closure of DB plans. The underlying incentives are not clear ex ante, and this is ultimately an empirical question to which I seek to shed more light. This leads to the last hypothesis:

H_3: Voluntary adoption of FRS17 is associated with DB pension provision decisions, all else equal.

3.2.4 DB plan terminations

Another stream of literature relevant to the present study is the one that analyses DB plan closures. During the last three decades, the number of firms sponsoring DB plans has decreased significantly (Kiosse and Peasnell, 2009). Therefore, the existing literature focuses primarily on the reasons (determinants) for DB plan terminations and it provides in general mixed evidence.

Early studies examine the termination of overfunded plans that became widespread during the 1980s. The majority of academic studies at that time indicate that plan terminations were attempts by financially distressed firms to access excess plan assets and thus several studies document wealth transfers from employees to shareholders (Alderson and Chen, 1986; Hamdallah and Ruland, 1986; Hsieh et al., 1990; Mittelstaedt, 1989; Thomas, 1989; Mittelstaedt and Regier, 1990; Petersen, 1992; Datta et al., 1995). Generally, these studies suggest that if a company is in financial distress, terminating a pension plan relieves the firm of future financial responsibility. Funds used for pension contributions would then be available for other uses by the firm such as to further reduce debt or fund projects that the firm was previously unable to undertake. Although prior research, mainly in the US setting, explains pension terminations prompted by the existence of excess pension assets as a form of financial slack, this explanation is not valid in the current economic environment where sponsoring firms are required to recognise any pension plan surplus or deficit on their balance sheets (Klumpes et al., 2007). In addition, historically in the UK the consensus view was that pension fund surpluses belong to plan members, depending on reasonable pension asset levels[31] (Howe and Saunders, 1992).

The economics of DB plans have changed significantly over the recent years. The strict regulations as well as recent developments in the financial markets have resulted in severely underfunded DB plans (Munnell and Soto, 2007). More recent studies on DB plan terminations explore the potential effect that changes in accounting regulation (e.g. Kiosse and Peasnell, 2009; Beaudoin, Chandar and Werner, 2010) along with firm and pension plan characteristics have

[31] 'Historically, in the UK most trust or plan documents do not provide for surplus reversion to employer sponsors on plan termination. Rather, trust documentation often gives trustees discretion to improve member benefits, with some plans providing surplus ownership to plan members' (Howe and Saunders, 1992).

in the decision to terminate a DB plan (e.g. Munnell and Soto, 2007; Comprix and Muller, 2011), while others consider the changes in the labour characteristics and preferences (e.g. Cowan and Power, 2003; Coronado and Copeland, 2004; Aaronson and Coronado, 2005; Kapinos, 2012; D'Souza et al., 2013). Kiosse and Peasnell, (2009) note that in the UK and the US the main reason behind DB freezes is the increased costs related with these plans and although accounting regulation has played a role this does not appear to be the main reason. However, the literature provides some evidence about the impact of accounting standards on pension provision decisions, mainly in the US setting. For example, Beaudoin et al. (2010) find that the effect of the adoption of Statement of Financial Accounting Standards No. 158 (SFAS 158) in the US is significantly related with firms' decision to terminate their DB plans. Moreover, Munnell and Soto (2007) examine firm, plan and industry characteristics in a sample of US firms during 2004 and 2005 and find that larger firms and companies that have low credit coverage relative to income, considerable legacy costs, low funding ratios and operate in R&D intensive industries are more likely to freeze their DB plans, while they do not find any significant effect of profitability on the decision to freeze DB plans. The authors conclude that the future earnings of companies that have such characteristics are more likely to be affected by expected reporting changes from the Financial Accounting Standards Board (FASB). Therefore, they are more likely to freeze DB plans.

Comprix and Muller (2011) nevertheless find that large firms are less likely to freeze, and that the funding ratio does not affect the probability of freezing. Moreover, Beaudoin et al. (2010) and Comprix and Muller (2011) find that the profitability of the sponsor firm plays an important role in the decision to freeze. Furthermore, Cowan and Power (2003), Coronado and Copeland, (2004) and Aaronson and Coronado, (2005), show that the conversion from DB to cash balance (CB)[32] in the US is mainly done to appeal to a younger and more mobile workforce. On the contrary, D'Souza et al. (2013) do not find evidence that CB conversions are related with higher labour mobility. Rather, they suggest that firms for whom pension terminations are costly in terms of employee resistance, political visibility or explicit tax costs and those that are more likely to have

[32] In the US the cash balance (CB) pension schemes have become popular as a way to limit the risk for the employer (Cowan and Power, 2003). Cash balance schemes are legally recognized as defined benefit schemes but with several characteristics of defined contribution plans. See Cahill and Soto (2003), for a detailed description of cash balance schemes.

financial accounting benefits from retaining DB plans are more likely to convert to CB plans than terminate their plans.

The results of the prior literature which is mainly US- based do not point to a single factor driving DB plan terminations, but rather they suggest several factors combined. It should also be noted that the characteristics of companies that decide to close DB plans have changed historically. For example, in the past, most companies that closed their DB schemes were those facing bankruptcy or survival issues. However, it is worth noting that more recently, even healthy companies are making termination decisions with regards to their DB pension plans (Munnell and Soto, 2007).

3.3 Research design

To examine the determinants of a firm's decision to retain their DB plans, I use a duration hazard model. To implement the hazard model, I define the duration of interest starting with the first year in my sample period, e.g., 1999, or the first year that the firm appears in the Index during my sample period (whichever is the earliest) ending with the year that the DB plan is closed or 2013, if the plan has not closed during the period examined in this study. The general form of a hazard model is:

$$\ln h_i(t) = \alpha(t) + BX_i(t) \qquad (3.1)$$

where:

$h_{ij}(t)$=the hazard, or instantaneous risk of closure, at time t for company i, conditional on survival to t;

$\alpha(t)$ = the baseline hazard;

B is a vector of coefficients; and

$X_i(t)$ is a matrix of observations on explanatory variables, some of which may vary with time.

I estimate the model using the proportional likelihood estimation developed by Cox (1972).[33] In the Cox model, no distributional assumptions are needed for $\alpha(t)$, the hazard function, or for the estimation of the coefficients. The estimated coefficient vector depends only on the rank order of the dependent

[33] The Cox regression is a more appropriate model compared to logit and probit models, which assume an underlying distribution for the predictor variables (Henebry, 1996).

variable and is invariant with respect to monotonic transformations of the dependent variable. In this case, the dependent variable is t, time to failure. Cox proportional hazards model has been heavily used in bankruptcy prediction studies (Lane, Looney and Wansley, 1986; Crapp and Stevenson, 1987; Shumway, 2001; LeClere, 2000; Liu, 2004). LeClere (2000) notes that qualitative response models such as logistic regression or probit models employ data from the time period directly preceding the occurrence of the event of bankruptcy. Hence, the author considers those models static because they do not consider the entire time period preceding the event. Similarly, in this study the use of a survival model such as the Cox proportional model is more appropriate. Moreover, Liu (2004) observes that failure rates change with changes in the time-series of economic data. Survival analysis is ideally suited to introducing a time dimension into DB plan survival since the objective is to estimate $S(t) = P(T>t)$, the probability that DB plan closure will occur at a time T which lies beyond the time horizon t, for a range of values of t. Thus, a time dimension is embedded in the dependent variable of the model. The time dimension is also introduced to the independent variables by making them time-varying. For example, Chen, Lin and Zhou (2011) refer that a vector giving the asset turnover for a firm over a ten-year period would be treated as a single variable, but the value of that variable would be updated as we follow the firm through time in estimating the survival model.

The 'failure event' in this case is captured by the variables HAZARD_PART and HAZARD_FULL. These are indicator variables that take the value of 0 if the firm has an open DB plan and 1 if the plan is closed to new members and to all members, respectively. Thus, the failure value is 1. I examine both the hazard of a part and a full plan closure. I estimate separate models for each hypothesis (H_1, H_{2A}, H_{2B}, and H_3) discussed in Section 2. In addition, I interact each executive pension variable with the funding status of the plan to examine the incremental value of these variables for hypotheses H_{2A}, H_{2B} and interact each executive pension variable with FRS17 to examine the incremental value of those variables for hypothesis H_3.

To identify knowledge intensive firms and in particular firms for which human capital is important, I follow Barth et al. (2001) and measure INTANG as research and development and advertising expenses divided by operating

expenses.[34] Based on H_1, I predict the coefficients on INTANG and R&D to be negative, suggesting that if the firm is a knowledge intensive firm then the firm is more likely to retain the DB plan (or alternatively the hazard of closure is less likely). CEO_MAINDB (CFO_MAINDB) is an indicator variable equal to 1 if the CEO (CFO) is part of the company's main DB plan and 0 otherwise. Based on hypothesis H_{2A}, I predict a negative coefficient for CEO_MAINDB and CFO_MAINDB, which would suggest a higher likelihood of keeping DB plans open. CEO_EXCLDB (CFO_EXCLDB) is an indicator variable, which takes the value of 1 if the CEO (CFO) is a member of an exclusive executive DB plan and 0 otherwise. I do not have any a priori expectations about the sign of this variable. FRS17 is an indicator variable that equals 1 if the firm voluntarily adopted FRS 17 in the years 2001, 2002, 2003 and 2004 and 0 otherwise; I do not have any strong expectations about the sign of the FRS17 coefficient.

Following Beaudoin et al. (2010), I also control for the CEO tenure and CFO tenure: CEO_TENURE (CFO_TENURE) captures the number of years that the CEO (CFO) holds the position. Following the extant literature, I include several control variables. To gauge how easy or difficult it is for a firm to keep DB plans open, I include three control variables: the ratio of active participants to total employees (ACTIVE), which measures the proportion of the firm's employees that are currently offered a DB pension (Munnell and Soto, 2007). In addition, I include lagged plan size (PLAN_SIZE) measured as the natural logarithm of the fair value of pension plan assets.[35] Finally, I include the lagged salary cap (SALARY_CAP), which is an indicator variable equal to 1 if the firm has imposed a cap in the pensionable salary and 0 otherwise. Plans that are offered to a greater number of employees will face greater constraints if they proceed in DB pension closures compared to firms that are offered to a smaller part of the workforce (Munnell and Soto, 2007). In addition, larger firms and firms with larger DB pension plans will face more resistance and will potentially experience higher reputational costs due to greater potential negative media coverage (Comprix and Muller, 2011). Firms that have imposed a cap on pensionable salaries are partly controlling the inflation risk associated with DB plans. Thus, I expect a negative coefficient on ACTIVE, FIRM_SIZE, PLAN_SIZE and SALARY_CAP.

[34] I also use R&D measured as research and development divided by total employees and results are similar for those two measures.
[35] The model also included firm size as a control variable but due to the high correlation coefficient between firm size and plan size I excluded this variable from the model.

To control for the health of the pension plan, I include the lagged funding status of the plan (FUNDED) which is an indicator variable equal to 1 if the plan is overfunded and zero otherwise.[36] Cowan and Power (2003), Comprix and Muller (2011), and D'Souza et al. (2013) suggest that employers are more likely to close DB plans that are more costly. In this case, the higher the deficit in the pension plan the higher the cost. In addition, Rauh (2006) finds that contributions to DB pension plans pose a real constraint on capital expenditures of the firm. To the extent that an overfunded plan is an indication of a healthier plan, I expect a negative coefficient on FUNDED.

Moreover, the economics literature shows that DB pension plans provide management with negotiation leverage in discussions with employees or trade unions (Ippolito, 1985). In situations where management are negotiating costly wage increases, these can be limited by promising to make additional contributions to the pension plans (Ippolito, 1985). To control for the level of wages, I include average salaries (SALARY_AVG) measured as the ratio of wages and salaries to total employees. Plans that are subject to collective-bargaining must negotiate with trade unions for any major decisions affecting the plan including closure decisions. Hence, plans that are covered by unions are arguably more difficult to freeze compared to plans that are not covered by unions (Munnell and Soto, 2007; Kapinos 2009 and 2012; Comprix and Muller, 2011). UNION is measured as the union density per industry based on the UK SIC industry classification. I use the lagged value of UNION and predict a negative coefficient on UNION.

To control for the financial situation of the firm, I use leverage (LEVERAGE) measured as the ratio of the book value of debt to the book value of debt plus the market value of equity (Rauh, 2008) and the lagged value of the standard deviation of operating cash flows (STDEV_OCF) for the current and previous three years (Anantharaman and Lee, 2014). In addition, I include the lagged operating profit margin (EBIT) measured as earnings before interest and taxes divided by total sales following Rauh and Stefanescu (2009). I expect that firms with lower leverage, lower variation of operating cash flows and higher operating profit margin to be more likely to retain their DB plans. Hence, I predict

[36] According to the Pension Act 1995 (Sec 60 (1)) a 'serious underprovision' arises in the case where the scheme's assets are less than 90 percent of its liabilities. The sponsoring employers with funds falling below 90 percent are required to increase their cash contributions so as to eliminate the deficit within one year.

a positive coefficient for LEVERAGE and STDEV_OCF and a negative coefficient for EBIT. I also include the sales growth (GROWTH) measured as the percentage change in sales and the market risk measured by lagged beta (BETA) to control for the market valuation of future growth opportunities and market risk. I expect a positive coefficient on GROWTH and a negative coefficient on BETA.

In the models where the hazard is full DB plan closure I also include PARTLY_CLOSED an indicator variable that takes the value of 1 if the plan is closed to new entrants and 0 otherwise.

All specifications include industry fixed effects ($\sum_{k=1}^{n} \beta_k Industry_k \, \varepsilon_{i,t}$) to control for cross-sectional differences within industries.[37] All models use robust standard errors clustered by firm to correct for heteroscedasticity and serial correlation (Rogers, 1993). Variable definitions are presented in Table 3.1.

3.4 Sample selection and descriptive statistics

3.4.1 Sample selection

Table 3.2 presents the sample selection process. The initial sample includes all firms that are constituents of the FTSE All-Share index from 1999[38] until 2013. I subsequently remove firms not sponsoring a DB plan. Finally, I omit firms that sponsor a DB plan in another country given that plans in other countries may be affected by regulation and institutional setting in those countries. For those firms I collect data from 1999[39] to 2013. Given the research design, I subsequently omit firm-year observations after the plan part and full closure from the sample. The final sample used in the empirical analysis after taking into consideration missing observations includes 1,371 firm-year observations for the analysis of partly closed DB plans and 2,684 firm-year observations for the analysis of the full closure of the plans.[40] Table 3.2 presents the sample selection

[37] I use Fama and French 12 industry classification codes.

[38]The sample period begins in 1999 because this is the first year for which firms provide information on the market value of the pension plan assets and liabilities in the notes to the financial statements, as required by FRS 17. Before year 1999, UK firms provided disclosures under SSAP 24, which was based on actuarial calculations. If the market value of plan assets and liabilities is not provided for 1999 I use the market valuation provided for 2000.

[39] The starting year is 1999 or the first year in which the firm appears in the FTSE All - Share index.

[40] The sample is also reduced because I use lagged values for control variables.

process.[41] Data on financial and pension variables are hand-collected from annual reports and extracted from Worldscope.[42] Data on pension plan members are hand-collected from 'Pension Funds and Their Advisers' publication.[43] Data sources for all variables are presented in Table 3.1.

"Insert Table 3.1 here"

"Insert Table 3.2 here"

3.4.2 Descriptive statistics

Table 3.3 provides information about the number of firms that retain their DB plans by year (Panel A) and by industry (Panel B).[44] Panel A, shows a monotone decrease of open plans over time. The number of firms with fully open plans has been declining with the largest decline being from 2006 onwards (Column 3), suggesting that the decision to retain DB plans is affected by the adverse conditions in the equity markets during this period. On the contrary, firms with partly open plans (i.e., typically open to existing employees only) (Column 4) shows a peak in the period 2001-2003 which coincides with the adoption of FRS 17 for UK companies. Then the number of plans that are partly open declines gradually up until the end of the sample period in 2013. It is important to clarify that all sample firms that close DB plans, either to new or existing employees, set up some type of DC plan.[45] Finally, there are a few full closures during 2002 and 2003, but the number of fully closed DB plans has been increasing after 2006 reaching a maximum in 2011 (19 plans) (Column 5). Panel B shows that firms in mature industries such as Manufacturing and Utilities have higher retention of DB

[41] All tables are presented at the end of the chapter in Appendix II.
[42] Variables were checked against Thomson Reuters database and against financial statements to ensure that all values are as reported and to add any missing variables. Pension data are hand-collected for 1999, 2000 and 2001.
[43] Pension Funds and Their Advisers is an annual edition that provides financial and contact information for the UK's major pension funds and details on their advisory firms.
[44] The number of firms through the years is not consistent as many firms leave the market (either close or become private) while others enter the market.
[45] The main groups of DC plans that have been identified from hand-collected data from pension footnotes are money purchase plans or self-invested personal pension plans (SIPP) or stakeholder plans.

plans (Columns 3 and 4). An interesting fact is that firms in industries such as utilities and energy do not appear to have any full DB plan closures (Column 5).

"Insert Table 3.3 here"

Table 3.4 reports descriptive statistics for the variables used in the empirical analyses and their associated tests of differences in means. Panel A of this Table shows descriptive statistics for the sample of firms in which I examine the hazard of partial closure while Panel B presents descriptive statistics for the sample of firms in which I examine the hazard of full DB plan closures; Panel C shows tests of differences in means. Continuous variables have been winsorized at 1% and 99% to avoid the effect of outliers. Panel A shows that intangibles are very low on average (1.4%). Approximately 61% of CEOs and 66% of CFOs participate in the firms' main pension plan, while only 8.4% and 9.8% of CEOs and CFOs respectively are members of a separate executive plan. This suggests that most of the executives in this sample are members of the firm's main DB plan. Moreover, only 5% of the firms in the sample have voluntarily adopted FRS17. In addition, 65% of the plans in this sample are overfunded. The CEO and CFO tenure are on average 4.8 years. The mean (median) proportion of active participants in the main DB plan is 31% (23%). 24.5% of firms in this sample are on average unionised and 5.9% of firms in the sample imposed a salary cap on pension benefits. The average (median) plan size is about 5.8 (5.8). The average (median) profitability is 13% (8.7%) and the average (median) leverage ratio is 46% (44.9%) while average (median) sales growth is 9.1% (5.9%). Moreover, the average (median) market beta is 0.94 (0.95), indicating that firms in the sample have low systematic risk.

Panel B shows that in this sample intangibles are on average slightly higher (1.7%). 49.8% of CEOs and 56.4% of the CFOs participate in the firm's main pension plan while only 8.3% and 8.8% of CEOs and CFOs respectively participate in an executive pension plan. The number of CEOs and CFOs that participate in the firms' main DB plan is lower in this sample suggesting that firms that fully close DB plans have lower proportion of executives participating in the main DB plan. In addition, only 5.1% of the firms in the sample have voluntarily adopted FRS17. Moreover, approximately 52% of firms in this sample are overfunded suggesting that firms that fully close DB plans are less funded as

compared to firms that partly close them. The average CEO and CFO tenure are 5 years. The mean (median) ratio of active plan participants to total employees is lower in this sample 28.2% (20.5%), suggesting that firms that close DB plans to all employees have less active participants as compared to the sample of firms that have only closed DB plans to new entrants. The number of firms that imposed a pensionable salary cap increases significantly to 16% while average union density increases to 28%. In addition, the average salary is higher for the sample of firms that fully close DB plans (0.028) compared to firms that partly close them suggesting that these firms are likely to compensate for the closure of DB plans with higher salaries. The average (median) plan size is 5.7 (5.8) the average (median) market beta is 0.97 (0.96). Average growth is lower (7.6%) compared to the sample of firms with partly closed plans. Overall, when comparing the two samples, it can be observed that firms that fully close their DB plans have more intangibles and less CEOs and CFOs that participate in the firm's qualified DB plan relative to the sample of firms that partially close DB plans. Moreover, these firms have less funded pension plans. In addition, firms that close DB plans to all employees have less active participants in the DB plan and higher union density; have imposed more pensionable salary caps, offer higher salaries on average and have higher market risk compared to firms that have closed their DB plans only to new entrants.

"Insert Table 3.4 here"

Table 3.5 presents the correlation matrix for the sample of firms in which I examine the partial closures (upper diagonal) and for the sample of firms in which I examine full closures (lower diagonal). The table shows that HAZARD_PART is negatively correlated to FUNDED (-0.13), suggesting that better funded plans are more likely to remain open and there is also some evidence that plan size (PLAN_SIZE) (-0.05) and union density (UNION) (-0.06) are negatively correlated with HAZARD_PART. In addition, CEO_TENURE is positively correlated with HAZARD_PART (0.05) suggesting that the longer a CEO remains on the board the more likely the plan to close to new entrants.

The lower diagonal in Table 3.5 shows that HAZARD_FULL is negatively correlated with both CEO (-0.11) and CFO (-0.11) being members of the company's main DB plan (CEO_MAINDB and CFO_MAINDB). HAZARD_FULL

is also negatively correlated with CFO_EXCLDB (-0.04), suggesting that CEOs are more likely to keep DB plans fully open when they are members of the firm's pension plan while CFOs are likely to retain DB plans despite of whether they are members of the company's or of an exclusive executive plan. FRS17 is negatively correlated with HAZARD_FULL (-0.04) suggesting that firms that adopted FRS17 are less likely to fully close their DB plans. HAZARD_FULL is negatively correlated with FUNDED (-0.07) suggesting that firms with funded plans are more likely to retain DB plans open. CFO_TENURE is also negatively correlated with HAZARD_FULL (-0.03) suggesting that the more the CFOs remain on the board the more likely they are to retain DB plans. Moreover, HAZARD_FULL is negatively correlated with the ratio of active members to total firm employees (ACTIVE) (-0.05) UNION (-0.07) and sales growth (GROWTH) (-0.04). On the contrary, the standard deviation of operating cash flows (STDEV_OCF) (0.03), LEVERAGE (0.04) and BETA (0.07) are positively correlated with HAZARD_FULL, implying that riskier firms are more likely to fully close DB plans. SALARY_CAP (0.07) and PARTLY_CLOSED (0.11) are positively correlated with HAZARD_FULL, implying that firms that have imposed a pensionable salary cap and have partly closed their DB plans are more likely to fully close them.

The analysis discussed in this section provides descriptive information about the variables used in this study, without controlling for other factors that may influence the likelihood of keeping DB plans open. The next section reports the results of the Cox multivariate analysis, which examines variables that may have an impact on a firm's decision to retain DB pension plans.

"Insert Table 3.5 here"

3.5 Findings

Tables 3.6 and 3.7 present the results of the Cox regression which models the effects of covariates on the survival probability of DB plans.[46] Table 3.6 shows the results for main DB plans (MAINDB) (Panel A) and exclusive DB plans (EXCLDB) (Panel B) when the hazard is a partial closure of the DB plan. Table 3.7 shows the results for MAINDB plans (Panel A) and EXCLDB plans (Panel B)

[46] Coefficients with a negative sign indicate a positive impact on the probability of DB plan retention, while coefficients with a positive coefficient indicate a negative impact on the probability of DB plan retention.

when the hazard is a full DB plan closure. Column (1) in both tables (Panel A) reports the results of the basic model which shows the effect that a firm with highly skilled human capital has on the survival of DB plans (H_1), while controlling for other variables which may have an impact on DB plan retention. Column (1) in Table 3.6, shows that the coefficient on INTANG is not statistically significant when the hazard is a partial DB closure while is negative and statistically significant (at the 10% level of significance) when the hazard is a full closure of the plan (Table 3.7), suggesting that being a knowledge intensive firm increases the survival rate of a DB plan, consistent with the first hypothesis.[47] However, since this appears to be the case only when the hazard is a full closure of the plan it suggests that DB plans are mainly seen as means of retaining existing employees rather than being used as a tool for attracting new employees. This is in line with the literature which suggests that a younger workforce prefers the portability of DC plans rather DB plans which in many cases cannot be transferred when switching jobs (e.g. Cowan and Power, 2003; Coronado and Copeland, 2004; Aaronson and Coronado, 2005; Kapinos, 2012; D'Souza, Jacob and Lougee, 2013). Moreover, the coefficient on FUNDED is negative and statistically significant when the hazard is a full plan closure (Table 3.7) suggesting that overfunded plans are more likely to remain fully open.

Next, I explore the influence of key executives such as the CEO and CFO on DB plan survival; Tables 3.6 and Table 3.7[48] report these findings. Table 3.6, Panel A, Column (2), shows that CEO_MAINDB has a negative and significant coefficient. These results suggest that controlling for INTANG and FUNDED, CEO membership in the firms' main DB plan increases the likelihood of DB plan survival consistent with H_{2A}. When I interact CEO_MAINDB with FUNDED (Column (3)), CEOs that are members of DB plan as the rest of the employees are more likely to retain these plans regardless of the funding status of the plan. This result holds for both hazards, part and full plan closure as it can be also observed in Table 3.7 (Columns (2) and (3)). In addition, the coefficient on CFO_MAINDB is statistically insignificant when the hazard is a part closure

[48] Results for CFO_EXCLDB are not reported in Table 3.7, Panel B, because the CFO_EXCLDB variable is collinear (negative collinearity) with the hazard variable (HAZARD_FULL). Coefficients for the variables that have (any form of) collinearity cannot be estimated.

(Table 3.6, Column (4)) while it is negative and highly significant in the case of a full closure (Table 3.7, Column (4)), suggesting that after controlling for INTANG and FUNDED, the participation of CFOs in the firm's main DB plan has a positive effect on DB plan survival, also supporting H_{2A}. Column (5) in both Tables reports the results when I interact CFO_MAINDB with FUNDED. Similar to CEOs, the findings show that when CFOs are members of the firm's main plan they are less likely to close DB plans to either new or existing members regardless of the funding status.

Table 3.6, Panel B reports the results for exclusive DB plans. The coefficient on CEO_EXCLDB and CFO_EXCLDB is statistically insignificant (Columns (2) and (4)) suggesting that management participation in a separate executive plan does not have any impact on the hazard of closure of the main DB plan. However, when interacting CEO/CFO_EXCLDB with FUNDED (Columns (3) and (5)) I find some marginal evidence that, when executives are members of an exclusive DB plan they are more likely to close DB plans to new entrants when the plan is underfunded while I do not find such evidence when the hazard is a full closure (Columns (6) and (7) in Table 3.7). Overall, these findings support hypotheses H_{2A} and H_{2B} suggesting that CEO participation in particular in the main DB plan is likely to increase the likelihood of DB plan retention; I also find some evidence that CFO participation in the main DB plan is also likely to increase the likelihood of DB plan retention.

Moreover, I examine the effect of the FRS17 adoption on DB plan retention. Columns (6) - (9) in Table 3.6, Panels A[49] and B report the findings for H_{3}.[50] Panel A shows that FRS17 does not have any effect on the likelihood of DB plan survival (Column 6). However, when interacted with CFO_MAINDB I find that firms that adopted FRS17 and their CFOs are members of main plans are less likely to close DB plans to new entrants (Panel A, Column 10). On the contrary, when I interact FRS17 with CEO/CFO_EXCLDB (Panel B, Columns (8) and (10)), I find that firms that voluntarily adopted FRS17 and their CEOs/CFOs

[49] Panel A, does not report the interaction between FRS17 and CEO_MAINDB (Column 8). Interacting those two variables was not possible because there are no observations where FRS17 and CEO_MAINDB overlap i.e. where FRS17 and CEO_MAINDB are simultaneously 1.
[50] It was not possible to examine the effect that FRS17 has on the hazard of a full DB plan closure (Table 3.7) because the FRS17 variable is collinear (negative collinearity) with the hazard variable (HAZARD_FULL). Coefficients for the variables that have (any form of) collinearity cannot be estimated.

are members of an exclusive DB plan are less likely to retain DB plans partly open (i.e. the hazard of part closure increases for those firms). However, these findings provide only weak evidence about the effect that the FRS17 adoption has on the retention of DB plans; rather, they suggest that it is the executive pension plan incentives that play an important role.

With regards to the control variables, the coefficient on ACTIVE is positive and statistically significant while coefficients on UNION and PLAN_SIZE are negative and statistically significant in Table 3.6, suggesting that firms that have a higher proportion of active members, lower union density and smaller pension plans are more likely to close DB plans to new entrants. In Table 3.7 the coefficient on PLAN_SIZE is negative and statistically significant while coefficients on LEVERAGE and STDEV_OCF are positive and statistically significant suggesting that larger firms are more likely to retain DB plans fully open while firms with higher leverage and higher fluctuations of operating cash flows are less likely to retain DB plans fully open. The pseudo R-squared values suggest that the selected models are better as compared to the baseline model.[51]

Taken together, these results suggest that the duration of DB plans is longer in firms that operate in industries which rely on high skilled human capital and for firms in which CEOs and CFOs participate in the same DB plan as the rest of the employees. I do not find evidence that the adoption of FRS 17 had any effect on DB plan retention. These findings provide some weak evidence that DB plans are still considered as an important tool to retain highly skilled employees in line with the labour economics literature. They also indicate that CEO and CFO incentives are important in determining the DB plan survival rate.

"Insert Table 3.6 here"

“Insert Table 3.7 here”

[51] For non-linear regression models is not possible to compute a single R-squared that has all the characteristics of R-squared in the linear regression model, so these approximations are computed instead. The pseudo R-squared used in this case is the Cox and Snell (1989) R-squared which is based on the likelihood for the model compared to the log likelihood for a baseline model. Note that Cox and Snell (1989) pseudo R-squared has a maximum value that is not 1. In other words, this ratio is indicative of the degree to which the model parameters improve upon the prediction of the null model. The smaller this ratio, the greater the improvement and the higher the R-squared.

3.5.1 Do DB plan partial closures really matter?

As discussed earlier there is a need to clarify whether executives are worse off after the closure of the plan to new entrants. This will help to adjust my expectations regarding the effect that CEO (CFO) membership in the firms main DB plan has in the decision to close DB plans to new entrants. For this reason, I initially test whether executives are worse off after a partial plan closure using a cox hazard model where the hazard is imposing a pensionable salary cap (SC).[52] Table 3.8 presents the results of the Cox regression which models the hazard of having a pensionable salary cap as a result of a DB plan closure to new entrants.[53] Column (1) reports the results of a firm partly closing its DB plan (CLOSED_PART) on the hazard of imposing a salary cap while controlling for the funding status of the pension plan. The coefficient is positive and statistically significant at 1% level of significance suggesting that if a firm closes its DB plan to new entrants it is highly likely that this firm will also impose a pensionable salary cap to existing plan members. Columns (2-5) and (6–9) report how CEO and CFO pension plans (CEO_MAINDB, CEO_EXCLDB and CFO_MAINDB, CFO_ EXCLDB) respectively affect these results. More specifically, columns 2,3 and 6, 7 show that CEOs and CFOs being members of the firms pension plan or an exclusive pension plan does not have any impact on the hazard of a salary cap. However, when interacting those variables with CLOSED_PART an interesting result that emerges is that if the plan is closed to new entrants and the CEO is a member of that plan (Column 4) it does not have any effect on the probability of a salary cap. In contrast, when the plan is partly closed, and the CEO is a member of an exclusive plan (Column 5), then it is more likely for the firm to introduce a pensionable salary cap for existing scheme members. The results in Columns 8 and 9 show the CFO pension does not have any significant effect on the decision to impose a salary cap along with the DB plan being closed to new members. Overall, these results suggest that if a DB plan is closed to new entrants, the firm is also likely to adopt other forms of pension curtailments such as a pensionable

[52] I have also tested this using a probit model which provides (untabulated) similar results.
[53] For ease of interpretation I present the coefficients (βi) and not hazard ratios (exp(βi)). Variables with positive coefficients (the βi values) are associated with increased hazard and decreased survival times, i.e. as the predictor increases the hazard of the event increases and the predicted survival duration decreases. Negative coefficients indicate decreased hazard and increased survival times. In other words, If βi > 0, the hazard of closure is higher because $e^{\beta i} > 1$. If βi < 0, the hazard of closure is lower because $e^{\beta i} > 1$.

salary cap which will adversely affect existing members, especially when the CEO is a member of a separate executive DB plan. Hence, these results also suggest that the personal incentives of the CEO play a key role on pension curtailment decisions following the closure of the company's main DB plan to new members.

3.6 Additional analysis

In the UK, assets of DB pension plans are held in trusts and the trustees are responsible for the investment of pension plan assets as well as for producing and maintaining a schedule of contributions. In particular, the trustees need to decide about the level of contributions to the scheme, the pension plan investment strategy, amendment of scheme rules or the members' benefits and the closure or winding up of the plan (The Pensions Regulator, 2014). This suggests that the actions of the trustees will have significant implications on the behaviour of the management of the firm (Cocco and Volpin, 2007). Trustees could be either individual or corporate trustees and can be elected plan members, company or independent trustees. Among these types of trustees, special consideration is given to trustees who are also executive directors of the sponsoring company due to their conflict of interest between their role as executives and their role as trustees (Cocco and Volpin, 2007). The law specifies that trustees should not act in the benefit of any particular group and that they should act in the best interest of the scheme members (The Pensions Regulator, 2014). However, being a director of the sponsoring company as well as a trustee may potentially influence trustees' independence. This has been recognised by both the previous and the current pension regulatory authorities, namely OPRA and The Pensions Regulator. In particular, The Pension Regulator (2008) refers:

"Conflicts are likely to be of two main types:

- conflicts between the personal interest of a trustee, director or staff member and his duty to the beneficiaries of the pension scheme (the possibility of personal financial gain, for example); and
- conflicts between the duty owed by the trustee, director or staff member to the beneficiaries of the scheme and his fiduciary duty owed to other persons (for example, as a director of an employer company or as a trustee of another trust)."

In this study, I focus on the second type of conflict, specifically when the trustee is also the director of the sponsoring company. The Pension Regulator (2008) also provides some relevant situation specific examples in which other duties may influence decisions:

- "funding decisions which are unduly or inappropriately influenced by a trustee who also holds a senior role within the employer – may become more relevant when the employer operates performance related bonuses or incentives.
- trustee involvement in corporate transactions involving the sponsoring employer, where the interests of the scheme as a creditor may diverge from the benefits accruing to other parties to the transaction.
- a trustee who also holds a role within the employer is privy to sensitive information relating to the employer, which could have an impact or potential impact on the scheme.
- a decision to wind up/close the scheme to future accrual.
- where conversion terms for member options are under discussion, particularly those for commutation of pension at retirement; while trustees are likely to be motivated to ensure broad cost neutrality within the scheme, the employer may prefer and encourage conversion terms that lead to lower expected costs.
- trustees approaching retirement may be motivated by favourable options to improve benefits at a personal level as opposed to considering the wider implications."

Cocco and Volpin (2007) note that on the one hand insider-trustees may be a source of agency problems between shareholders and pension plan members. In this case, insider trustees act in line with shareholders' incentives by shifting the risk from shareholders to plan participants; on the other hand, insider trustees may act to the benefit of both shareholders and scheme members by integrating their financial and pension policies. More specifically, if a company increases leverage, uses the proceeds to fund the pension plan, and invests these funds in bonds, this may generate tax savings without affecting financial risk (Black, 1980, Tepper, 1981). Using a sample of UK firms between 2002 and 2003, Cocco and Volpin (2007) test these two alternative hypotheses and find

that insider trustees act in the interest of shareholders. More specifically, they find that companies with higher leverage and higher proportion of insider trustees invest in more risky assets, make fewer contributions, and have a higher dividend payout ratio. I extend those findings by examining how the presence of insider trustees affects a firm's decision to retain DB plans. As explained above, trustees play an important role in decisions related to the DB pension plans including the decision to alter pension benefits for particular groups of employees and the decision to close a DB plan. In particular, trustees who are also company executives (i.e., insider trustees) may have different incentives with regards to the decision to retain DB plans. Based on the above discussion, I do not make any specific predictions about the influence of the insider trustees on the decision of the firm to keep DB plans open. CEOs have the overall responsibility for corporate decisions and they will typically bear the reputation and other costs of bad decisions. However, DB plans are generally considered a form of long-term debt (Edmans and Liu, 2011) and the management of debt is a key responsibility of CFOs (e.g. Graham and Harvey, 2001; Graham, Harvey and Puri, 2008; Chava and Purnanandam, 2010). Hence, corporate pension decisions are of great importance especially when pension assets and liabilities are economically significant. Anantharaman and Lee (2014) find that CFOs in particular engage in risk shifting through pension underfunding when their compensation packages provide greater risk-taking incentives. I build on this research by analysing the effect that CEO trustees and CFO trustees have on the decision to retain DB plans. This setting allows me to explore the interesting question whether CEO and CFO personal incentives i.e., being member of the DB plan has an impact on DB retention decisions.

Using the sample employed in the main analysis, I hand-collect data on names of pension plan trustees from the *Pension Funds and Their Advisers* publication from 1999 to 2013. I manually check the names of trustees against information included in the BoardEx database and data collected manually from annual reports about the role(s) of each executive to establish whether trustees sit on the executive board. If they do so, I label these 'insider trustees'. Due to availability of data, the subsample for this analysis drops significantly. More specifically, for the partial open plans sample there are 1,115 firm-year observations available (171 unique firms) which drops to 800 firm-year observations once we delete missing observations and use lags in all

independent variables. For the sample of fully opens schemes, there are 2067 firm-year observations available (185 unique firms) which after removing missing observations and using lags for all independent variables reduces to 1,627 firm-year observations.[54] In this analysis I employ two new variables. CEO_TRUSTEE is an indicator variable that equals 1 if the trustee is also a firm's CEO and 0 otherwise; and CFO_TRUSTEE equals 1 if the trustee is also a firm's CFO and 0 otherwise. The rest of the variables are defined as above.

Table 3.9 reports the descriptive statistics and associated tests of differences in means for this subsample. Panel A, shows that, on average, there are 15.9% and 29% trustees are CEOs and CFOs, respectively, for the subsample of partial closures. Panel B, shows that 11.9% of trustees are also CEOs and 26.5% are also CFOs. The proportion of CFOs that are also trustees is higher than the CEOs. I assume that their financial knowledge makes them more relevant for the role of trustee. Because the trustee information is only available for a subsample of the main sample there may be some concern for self-selection bias. I therefore carry out univariate analysis testing differences in means for the subsample used in the analysis reported in this section and the sample used in the main analysis. Panel C, reports these results. Overall, there are no significant differences in means between the subsample used in this analysis and the sample used in the main analysis; however, I find some marginal evidence for some of the variables used in the analysis as follows: Panel A, INTANG at the 10% level of significance, CEO_MAINDB at the 10% level, CFO_MAINDB at 5% level and a few of the control variables are statistically different between the two samples. Panel B, CFO_EXCLDB at 10% level and a few of the control variables are statistically different between the two samples.

Tables 3.10 and 3.11 report the results of the Cox regression model for the additional analysis. Table 3.10 shows the results for MAIN_DB plans (Panel A) and EXCLDB (Panel B) when the hazard is a part closure of the DB plan. Table 3.10 shows the results for MAIN_DB plans (Panel A) and EXCLDB (Panel B) when the hazard is a full DB plan closure. In Column (1) using the subsample available for the additional analysis I estimate the basic model as in Tables 3.7 and 3.8. As it can be seen the results are similar to the ones obtained for the main

[54] I delete observations after the first year of a part (full) closure. This information refers to these data.

sample. Table 3.10, Panel A, Columns (2) and (7) report the effect of CEO_TRUSTEES and CFO_TRUSTEES on DB plan retention. The coefficient on CEO_TRUSTEE is positive and statistically significant (at 10% level of significance) suggesting that the presence of CEOs as trustees can positively affect the decision to retain DB plans partly open. I do not find such evidence for CFO_TRUSTEES. I then interact CEO_TRUSTEE/ CFO_TRUSTEE with FUNDED (Columns (3) and (8)) respectively. I find some evidence that when the plan is overfunded, CEOs who are also trustees are more likely to retain DB plans (at 5% level of significance), while I do not find such evidence for a CFO trustees.

To analyse CEOs/CFOs personal incentives I initially add into the model CEO/CFO_MAINDB (CEO/CFO_EXCLDB) and then I utilize two way and three way interactions to examine the effect of CEO/CFO_TRUSTEE and CEO/CFO_MAINDB (CEO/CFO_EXCLDB) and FUNDED simultaneously.[55] The results reported in Columns (4) suggest that after controlling for CEO trustees, when CEOs are members of the main DB plan the survival rate of the DB plan is likely to increase which is consistent with my findings in the main analysis. Moreover, the results in Columns (5) show that CEO trustees that are also members of the firms' DB plan are more likely to retain this plan partly open even if it is underfunded. I also find evidence that CEO trustees that are members of an exclusive executive plan are more likely to close the main DB plan to new entrants (Panel B, Column (6). I also examine the role of CFOs; I do not find any statistical significance for CFO_TRUSTEES but consistent with the findings for CEOs, I find that participation of CFOs in the main DB plan after controlling for CFO_TRUSTEES increases the likelihood of DB plan retention. In addition, participation of CFOs in an exclusive DB plan decreases the likelihood of DB plan retention.

Taken together these results suggest that firms where CEOs and CFOs are also trustees are more likely to retain DB plans. In addition, when CEOs/CFOs, and also trustees then they are more likely to retain those plans; while when they are members of an exclusive executive DB plan then they are more likely to close these plans to new entrants. The results overall reflect the

[55] Two way and three way interactions were not possible to be estimated in Table 3.11 where the hazard is a full plan closure, due to collinearity. Coefficients for the variables that have (any form of) collinearity cannot be estimated.

role of insider trustees on pension provision decisions and suggest that their decisions are motivated by their personal incentives.

3.7 Conclusions

This chapter examines the determinants of defined benefit plan retentions in the UK. I hypothesise that firms for which human capital is important, are more likely to retain their defined benefit pension plans. In addition, I expect that defined benefit plans are more likely to be retained when key executives such as the CEO and the CFO are members of the firm's main DB plan; however, I do not have any strong predictions about the impact of CEO/CFO participation in separate executive DB plans on pension provision decisions. Using hand-collected data on a sample of FTSE All-Share firms that sponsor DB plans, for which data were available from 1999 to 2013, the results suggest that firms where human capital is important are more likely to retain DB plans. This result implies that DB plans are important means to retain highly skilled employees consistent with economic theory. In addition, the participation of CEOs and CFOs in the firms' main pension plan, as the rest of the employees, has a significantly positive effect on the survival of DB plans. I do not find any evidence that the adoption of FRS 17 from UK firms had any effect on the survival rate of DB plans. Moreover, using a subsample for which data on the names of the trustees are available and also information about whether they are members of the executive board, I examine the impact of insider trustees on the survival rate of DB schemes. I find that the presence of CEOs on the board of trustees is more likely to lead to defined benefit plan retentions, suggesting that the CEO plays a key role in corporate pension provision decisions.

Overall, these results shed light on the factors influencing DB plan survival in the UK and document the key role of human capital and managerial incentives on such decisions. This study contributes to the existing body of literature examining the impact of managerial incentives on corporate decisions by showing the importance of CEO and CFO incentives on the decision to retain defined benefit plans. In addition, this study examines the determinants of defined benefit plan retentions and in this context, it contributes to the literature on pension provision as well as studies examining the economic consequences of accounting standards. Finally, this study contributes to the corporate governance

literature by examining the role of insider trustees who may also be members of the company's defined benefit plan.

Appendix II

Table 3.1: Variable definitions and sources

Variable	Description	Source
HAZARD_PART	Indicator variable that is equal to 1 if the firm has closed its plan to new employees only and 0 otherwise.	Hand-collected from Annual Reports
HAZARD_FULL	Indicator variable that is equal to 1 if the firm has closed its plan to all) new and existing) employees only and 0 otherwise.	Hand-collected from Annual Reports
CEO_MAINDB	Indicator variable that is equal to 1 if the CEO is a member of the main DB plan as the rest of the employees, and 0 otherwise.	Hand-collected from Annual Reports
CEO_EXCLDB	Indicator variable that is equal to 1 if the CEO is a member of a separate executive DB plan, and 0 otherwise.	Hand-collected from Annual Reports
CFO_MAINDB	Indicator variable that is equal to 1 if the CFO is a member of the main DB plan as the rest of the employees, and 0 otherwise.	Hand-collected from Annual Reports
CFO_EXCLDB	Indicator variable that is equal to 1 if the CFO is a member of a separate executive DB plan, and 0 otherwise.	Hand-collected from Annual Reports
FUNDED	Funding status computed by dividing the fair value of plan assets by the projected benefit obligation.	Worldscope and hand-collected from Annual Reports
INTANG	Following Barth et al. (2001) this is calculated as: Research and development and advertising expenses divided by operating expenses.	Hand-collected from Annual Reports
CEO_TENURE	The number of years the CEO holds the position.	Hand-collected from Annual Reports
CFO_TENURE	The number of years the CFO holds the position.	Hand-collected from Annual Reports
CEO_TRUSTEE	Indicator variable that is equal to 1 if the CEO is also the trustee of the company, and 0 otherwise.	Hand-collected from 'Pension Funds and Their Advisors'
CFO_TRUSTEE	Indicator variable that is equal to 1 if the CFO is also the trustee of the company, and 0 otherwise.	Hand-collected from 'Pension Funds and Their Advisors'
ACTIVE	Number of active members of the plan divided by the total number of employees.	Hand-collected from 'Pension Funds and Their Advisers'

UNION	The union density by industry based on UK SIC code.	Office of National Statistics: Trade Union Statistics
PLAN_SIZE	Pension plan size is computed by the natural logarithm of the fair value of pension plan assets.	Worldscope and hand-collected
SALARY_CAP	Indicator variable that equals 1 if the firm imposed a cap on pensionable salaries and 0 otherwise.	Hand-collected from Annual Reports
SALARY_AVG	The average salary is computed by dividing salaries and wages by the total number of employees.	Worldscope
LEVERAGE	Following Rauh (2008) this is calculated as follows: (Book Debt) / (Book Debt+ Market Value of Equity), where the book debt excludes the effect of pensions.	Worldscope
STDEV_OCF	Standard deviation of operating cash flows for the current and previous four years.	Worldscope
EBIT	Measure of profitability computed by dividing EBIT by Sales.	Worldscope
GROWTH	Growth is computed as follows: (Salest – Salest-1)/Salest-1.	Worldscope
BETA	Market beta	The London Share Price Database (LSPD)
PARTLY_CLOSED	Indicator variable that equals 1 if the firm has closed its DB plan to new entrants and 0 otherwise.	Hand-collected from Annual Reports

Table 3.2: Sample selection process

	Firms	Firm-year observations
FTSE All-Share constituents 2000-2013	1340	
After deleting firms that do not sponsor a DB plan or firms sponsoring an overseas DB scheme	322	3,625
Whereof:		
Sample for partially open plans	306	1,371
Sample for fully open plans	322†	2,684

†16 firms fully closed their DB plans and as such not included in the sample of partially open plans.

Notes: Table 3.2 presents the sample selection process.

Table 3.3: Defined benefit pension plan provision by year and industry

Panel A: Defined Benefit Pension Provision by Year

Year	Total # of firms that sponsor a DB plan	# of firms with fully open plans (to new and existing members)	# of firms with partly open plans (open to existing members only)	# of firms with closed DB plans
1999	292	292	-	-
2000	299	299	-	-
2001	295	267	28	-
2002	291	233	57	1
2003	280	228	48	4
2004	264	251	13	-
2005	255	236	19	-
2006	238	218	19	1
2007	218	202	8	8
2008	197	185	4	8
2009	185	175	4	6
2010	171	150	5	16
2011	150	127	4	19
2012	129	121	2	6
2013	121	113	3	5
Total	322	92	214	74

Panel B: Defined Benefit Pension Provision by Industry

Industry	Total # of firms that sponsor a DB plan	# of firms with fully open plans (to new and existing members)	# of firms with partly open plans (open to existing members only)	# of firms with closed DB plans
Consumer Non-Durables	30	9	21	7
Consumer Durables	4	0	4	0
Manufacturing	40	12	24	11
Energy	9	4	5	0
Chemicals	9	0	8	2
Business Equipment	21	8	10	6
Telecoms	8	2	6	1
Utilities	13	6	7	0
Wholesale and Retail Trade	54	16	35	16
Healthcare	13	4	8	1
Money Finance	38	10	27	8
Others	83	21	59	22
Total	322	92	214	74

Notes: Table 3.3 presents descriptive information on defined benefit pension provision by year (Panel A) and by industry (Panel B).

Table 3.4: Descriptive statistics and tests of differences in means.

Panel A: Partial Closures Analysis (N=1,371)

	Average	Std. Dev.	Min	P25	Median	P75	Max
INTANG	0.014	0.040	0.000	0.000	0.000	0.007	0.293
CEO_MAINDB	0.608	0.488	0.000	0.000	1.000	1.000	1.000
CEO_EXCLDB	0.084	0.277	0.000	0.000	0.000	0.000	1.000
CFO_MAINDB	0.655	0.476	0.000	0.000	1.000	1.000	1.000
CFO_EXCLDB	0.098	0.297	0.000	0.000	0.000	0.000	1.000
FRS17	0.050	0.219	0.000	0.000	0.000	0.000	1.000
FUNDED	0.650	0.477	0.000	0.000	1.000	1.000	1.000
CEO_TENURE	4.753	4.799	0.000	1.000	3.000	7.000	28.000
CFO_TENURE	4.762	4.547	0.000	1.000	3.000	7.000	22.000
ACTIVE	0.306	0.252	0.001	0.108	0.230	0.469	1.000
UNION	0.245	0.122	0.000	0.124	0.255	0.287	0.601
PLAN_SIZE	5.767	1.904	0.993	4.391	5.883	7.169	9.996
SALARY_CAP	0.059	0.236	0.000	0.000	0.000	0.000	1.000
SALARY_AVG	0.025	0.016	0.004	0.017	0.022	0.029	0.128
LEVERAGE	0.457	0.210	0.047	0.302	0.449	0.582	0.970
STDEV_OCF	0.032	0.033	0.001	0.012	0.024	0.040	0.207
EBIT	0.129	0.246	-0.981	0.045	0.087	0.154	1.189
GROWTH	0.091	0.289	-0.714	-0.031	0.059	0.166	1.446
BETA	0.939	0.274	0.039	0.760	0.950	1.110	1.960

Panel B: Full Closures Analysis (N=2,684)

	Average	Std. Dev.	Min	P25	Median	P75	Max
INTANG	0.017	0.048	0.000	0.000	0.000	0.009	0.293
CEO_MAINDB	0.498	0.500	0.000	0.000	0.000	1.000	1.000
CEO_EXCLDB	0.083	0.276	0.000	0.000	0.000	0.000	1.000
CFO_MAINDB	0.564	0.496	0.000	0.000	1.000	1.000	1.000
CFO_EXCLDB	0.088	0.284	0.000	0.000	0.000	0.000	1.000
FRS17	0.051	0.219	0.000	0.000	0.000	0.000	1.000
FUNDED	0.517	0.500	0.000	0.000	1.000	1.000	1.000
CEO_TENURE	5.063	5.253	0.000	1.000	4.000	7.000	28.000
CFO_TENURE	4.928	4.691	0.000	1.000	4.000	7.000	22.000
ACTIVE	0.282	0.245	0.000	0.091	0.205	0.419	1.000
UNION	0.220	0.113	0.000	0.119	0.215	0.271	0.601
PLAN_SIZE	5.714	1.859	0.993	4.300	5.770	7.020	9.996
SALARY_CAP	0.160	0.367	0.000	0.000	0.000	0.000	1.000
SALARY_AVG	0.028	0.018	0.004	0.018	0.024	0.032	0.128
LEVERAGE	0.444	0.213	0.047	0.292	0.429	0.574	0.970
STDEV_OCF	0.032	0.032	0.001	0.012	0.023	0.040	0.207
EBIT	0.127	0.213	-0.673	0.045	0.090	0.160	1.189
GROWTH	0.076	0.257	-0.714	-0.025	0.056	0.148	1.446
BETA	0.967	0.284	0.039	0.780	0.960	1.140	1.960
PARTLY_CLOSED	0.444	0.497	0.000	0.000	0.000	1.000	1.000

Panel C: TESTS OF DIFFERENCES MEANS				
	Partial Closures	Full Closures		
	Means		Difference	t-stat
INTANG	0.014	0.017	-0.003	-1.687*
CEO_MAINDB	0.608	0.498	0.110	5.889***
CEO_EXCLDB	0.084	0.083	0.001	0.252
CFO_MAINDB	0.655	0.564	0.091	5.327***
CFO_EXCLDB	0.098	0.088	0.010	0.904
FRS17	0.050	0.051	-0.001	-0.502
FUNDED	0.650	0.517	0.133	8.380***
CEO_TENURE	4.753	5.063	-0.310	-1.583
CFO_TENURE	4.762	4.928	-0.166	-1.067
ACTIVE	0.306	0.282	0.024	3.228***
UNION	0.245	0.282	-0.037	-6.294***
PLAN_SIZE	5.767	5.714	0.053	0.538
SALARY_CAP	0.059	0.160	-0.101	-10.13***
SALARY_AVG	0.025	0.028	-0.003	-4.663***
LEVERAGE	0.457	0.444	0.013	1.249
STDEV_OCF	0.032	0.032	0.000	0.932
EBIT	0.129	0.127	0.002	0.345
GROWTH	0.091	0.076	0.015	1.785*
BETA	0.939	0.967	-0.028	-2.941***

Notes: This table provides descriptive statistics and their associated test of differences in means for the variables used in the empirical analyses. Panel A, refers to the sample of firms in which I analyse the hazard of a partial DB plan closure; Panel B, refers to the sample of firms in which I analyse the hazard of a full DB plan closure; PANEL C refers to the associated tests of differences in means between the two samples. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed continuous variables are winsorized at 1% and 99% to avoid the effect of outliers. All variables are defined in Table 3.1.

Table 3.5: Correlations among the hazard of closure (partial and full) and test and control variables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
HAZARD FULL/PART (1)		-0.00	-0.04	0.00	0.01	-0.02	-0.02	-0.13***	0.05*	-0.02	0.02	-0.06**	-0.05*	-0.02	0.01	-0.01	0.01	-0.00	-0.02	0.02
INTANG (2)	-0.02		-0.06***	0.01	-0.12***	0.11***	0.11***	0	-0.05**	-0.01	0.08***	0.01	0.04	0.06**	0.14***	-0.19***	0.12***	-0.22***	0.01	0.05**
CEO_MAINDB (3)	-0.11***	-0.03*		-0.37***	0.49***	-0.37***	-0.04*	0.04***	0.08***	0.04	0.05*	0.03	0.03	-0.03	-0.03	-0.05*	0.04	0.10***	-0.02	-0.13***
CEO_EXCLUSIVE (4)	-0.03	0.02*	-0.30***		-0.35***	0.64***	-0.05*	-0.02***	-0.04	0.04	0.05*	0.03	0.05*	0.00	-0.07***	0.06**	0.00	-0.04*	-0.03	0.06***
CFO_MAINDB (5)	-0.11***	-0.09***	0.46**	-0.30***		-0.42***	0.03	0.07***	-0.07***	0.01	-0.03	0.04	0.07***	-0.11***	-0.08***	-0.03	-0.02	0.04	0.00	-0.09***
CFO_EXCLUSIVE (6)	-0.04**	0.09***	-0.29*	0.64***	-0.34***		0.01	-0.03	-0.02	0.04	0.00	0.04	0.09***	0.04*	-0.02	0.03	0.03	-0.06**	0.02	0.04
FRS17 (7)	-0.04*	0.00	-0.05***	0.04**	-0.04**	0.10***		-0.11***	0.00	-0.05**	-0.04	0.01	0.09***	-0.00	0.01	0.03	-0.03	-0.03	-0.02	0.01
FUNDED (8)	-0.07***	-0.03*	0.06*	-0.02	0.06**	-0.02	-0.07***		-0.04	-0.01	0.07***	0.09***	0.02	-0.09***	-0.04	0.03	0.04	0.03	0.07***	0.02
CEO_TENURE (9)	0.01	0.02	0.08***	-0.05***	-0.04*	-0.03*	-0.03*	-0.05***		0.21***	0.00	-0.02	-0.18***	0.00	0.02	-0.06**	0.01	0.08***	0.07***	-0.06***
CFO_TENURE (10)	-0.03*	0.04	0.04	-0.01	0.09*	0.02	0.02	-0.04	0.25*		-0.02	-0.03	-0.11***	-0.01	0.07***	-0.07***	-0.04	0.02	0.01	0.01
ACTIVE (11)	-0.05**	0.08***	0.07***	0.02	0.02	-0.01	-0.01	0.08***	0.00	-0.04*		0.32***	0.01	-0.01	0.29***	0.07***	0.023	0.14***	-0.04	-0.10***
UNION (12)	-0.07**	0.02	0.07***	0.04	0.08***	0.04	0.04	0.11***	-0.02	-0.02	0.32***		0.22***	-0.07***	0.12***	0.19***	-0.04	0.10***	-0.01	-0.14***
PLAN_SIZE (13)	-0.02	0.01	-0.06	0.05***	0.01	0.07***	0.07***	0.09***	-0.22***	-0.16***	0.04*	0.16***		0.15***	0.07***	0.22***	-0.20***	-0.13***	-0.09***	0.02
SALARY_CAP (14)	0.07***	0.09***	-0.08***	-0.03*	-0.16***	-0.03*	-0.03*	-0.06***	-0.02	0.02	0.00	-0.12***	0.08***		0.15***	-0.02	-0.07***	0.01	-0.03	0.07***
SALARY_AVG (15)	0.02	0.17***	-0.08***	-0.05***	-0.08***	-0.04**	-0.04**	-0.01	0.01	0.02	0.26***	0.09***	0.05***	0.12***		-0.04*	0.03	0.21***	0.00	0.12***
LEVERAGE (16)	0.04**	-0.28***	-0.03	0.01	0.00	-0.03	-0.03	0.06***	-0.11***	-0.12***	0.06***	0.14***	0.23***	-0.03*	-0.02		-0.16***	-0.06**	-0.11***	0.09***
STDEV_OCF (17)	0.03*	0.11***	0.05***	-0.02	0.00	0.01	0.01	0.04	0.03	-0.04	0.07***	-0.02	-0.19***	0.03	0.06***	-0.14***		-0.18***	0.09***	0.00
EBIT (18)	-0.03	-0.09*	0.05*	-0.03	0.01	-0.04	-0.04	0.03	0.06*	0.02	0.10*	0.10*	-0.13*	-0.05*	0.26*	-0.13*	-0.10*		-0.08***	-0.11***
GROWTH (19)	-0.04**	0.01	0.03	-0.03	0.02	0.01	0.01	0.07*	0.06*	0.02	-0.05	0.01	-0.08*	-0.03	0.01	-0.07*	0.07*	-0.05*		-0.05**
BETA (20)	0.07***	-0.04	-0.08*	-0.02	-0.02	-0.05*	-0.05*	0.00	-0.07*	-0.04*	-0.08*	-0.12*	0.03	0.07*	0.12*	0.17*	-0.02	-0.13*	-0.05*	
PARTLY_CLOSED (21)	0.11***	0.04	-0.18*	-0.02	-0.10*	-0.05*	-0.05*	-0.27*	-0.03	-0.01	-0.07*	-0.20*	0.05*	0.33*	0.20*	-0.02	-0.03	0.00	-0.06*	0.10*

Notes: Table 3.5 presents the Pearson correlation coefficients for the variables used in the empirical analyses. The upper diagonal refers to the sample of firms with partly closed DB plans; the lower diagonal refers to the sample of firms with fully closed plans. All variables are defined in Table 3.1.

Table 3.6: Cox regression results (Hazard: Partial DB plan closure)

Panel A: MAIN DB PLAN

	H1	H2A				H3				
	BASIC	CEO		CFO		BASIC	CEO		CFO	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)†	(9)	(10)
INTANG	1.315	1.089	1.021	1.402	1.341	1.208	0.975		1.299	1.373
	(0.69)	(0.55)	(0.51)	(0.72)	(0.69)	(0.63)	(0.49)		(0.67)	(0.73)
CEO/CFO_MAINDB		-0.284**	-0.455**	-0.030	-0.318*		-0.286**		-0.026	0.076
		(-2.08)	(-2.49)	(-0.21)	(-1.69)		(-2.09)		(-0.18)	(0.50)
FRS17						-0.236	-0.237		-0.245	0.780***
						(-0.81)	(-0.85)		(-0.83)	(2.65)
FUNDED	-0.125	-0.122	-0.297	-0.126	-0.485**	-0.120	-0.116		-0.121	-0.131
	(-0.86)	(-0.84)	(-1.51)	(-0.86)	(-2.13)	(-0.82)	(-0.80)		(-0.83)	(-0.89)
CEO/CFO_MAINDB * FUNDED			-0.423**		-0.235					
			(-2.17)		(-1.27)					
FRS17*CEO/CFO_MAINDB										-1.276**
										(-2.00)
CEO/CFO_TENURE		0.025*	0.026**	-0.012	-0.011		0.025*		-0.012	-0.014
		(1.95)	(1.96)	(-0.65)	(-0.63)		(1.94)		(-0.68)	(-0.77)
ACTIVE	0.592	0.570**	0.603**	0.595**	0.568**	0.588**	0.565**		0.591**	0.610**
	(2.17)	(2.11)	(2.23)	(2.18)	(2.09)	(2.16)	(2.09)		(2.17)	(2.24)
UNION	-1.574**	-1.755**	-1.838**	-1.504*	-1.619**	-1.537*	-1.716**		-1.461*	-1.603**
	(-1.94)	(-2.16)	(-2.28)	(-1.86)	(-2.04)	(-1.87)	(-2.08)		(-1.78)	(-1.97)
PLAN_SIZE	-0.089*	-0.071	-0.071	-0.089**	-0.094**	-0.087*	-0.069		-0.087**	-0.083*
	(-1.97)	(-1.54)	(-1.53)	(-2.00)	(-2.11)	(-1.93)	(-1.49)		(-1.97)	(-1.90)
SALARY_CAP	-0.285	-0.284	-0.265	-0.308	-0.274	-0.291	-0.289		-0.315	-0.350
	(-0.80)	(-0.78)	(-0.73)	(-0.86)	(-0.78)	(-0.82)	(-0.80)		(-0.88)	(-0.98)
SALARY_AVG	0.374	0.471	0.832	0.481	-0.0938	0.314	0.390		0.431	1.135
	(0.08)	(0.10)	(0.17)	(0.10)	(-0.02)	(0.06)	(0.08)		(0.09)	(0.24)
LEVERAGE	-0.344	-0.380	-0.387	-0.366	-0.331	-0.322	-0.359		-0.343	-0.322
	(-0.89)	(-0.97)	(-0.99)	(-0.94)	(-0.86)	(-0.84)	(-0.92)		(-0.88)	(-0.83)
STDEV_OCF	-0.413	0.202	0.199	-0.498	-0.198	-0.354	0.285		-0.444	-0.529
	(-0.21)	(0.10)	(0.10)	(-0.24)	(-0.10)	(-0.18)	(0.15)		(-0.22)	(-0.27)
EBIT	-0.393	-0.339	-0.354	-0.401	-0.396	-0.387	-0.332		-0.395	-0.410
	(-1.45)	(-1.19)	(-1.22)	(-1.49)	(-1.46)	(-1.44)	(-1.17)		(-1.48)	(-1.55)
GROWTH	0.028	-0.020	-0.006	0.026	0.026	0.028	-0.019		0.027	-0.010
	(0.12)	(-0.09)	(-0.03)	(0.12)	(0.12)	(0.13)	(-0.08)		(0.12)	(-0.04)
BETA	0.201	0.161	0.141	0.195	0.214	0.205	0.165		0.199	0.169
	(0.71)	(0.57)	(0.50)	(0.69)	(0.77)	(0.73)	(0.58)		(0.71)	(0.62)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes
SE Clustered by firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes
N	1,371	1,371	1,371	1,371	1,371	1,371	1,371		1,371	1,371
Pseudo R^2	0.014	0.018	0.018	0.018	0.016	0.015	0.018		0.015	0.019

Panel B: EXCLUSIVE DB PLAN

		H2B					H3			
		CEO		CFO			CEO		CFO	
	(1)‡	(2)	(3)	(4)	(5)	(6)‡	(7)	(8)	(9)	(10)
INTANG		1.066	0.941	1.396	1.009		0.970	1.033	1.285	1.563
		(0.55)	(0.48)	(0.72)	(0.49)		(0.50)	(0.53)	(0.66)	(0.83)
CEO/CFO_EXCLDB		0.138	0.570**	0.022	0.531*		0.131	0.073	0.025	-0.148
		(0.71)	(2.40)	(0.11)	(1.90)		(0.67)	(0.37)	(0.12)	(-0.63)
FRS17							-0.215	-0.350	-0.248	-0.650*
							(-0.74)	(-1.16)	(-0.84)	(-1.80)
FUNDED		-0.118	-0.038	-0.126	-0.029		-0.113	-0.100	-0.121	-0.129
		(-0.81)	(-0.25)	(-0.86)	(-0.19)		(-0.77)	(-0.68)	(-0.82)	(-0.88)
CEO/CFO_EXCLDB * FUNDED			-0.521		-0.788*					
			(-1.14)		(-1.66)					
FRS17 * CEO/CFO_EXCLDB								2.053***		1.191***
								(4.79)		(3.84)
CEO/CFO_TENURE		0.024*	0.027**	-0.012	-0.014		0.024*	0.025*	-0.012	-0.014
		(1.87)	(2.01)	(-0.66)	(-0.78)		(1.86)	(1.92)	(-0.68)	(-0.77)
ACTIVE		0.586**	0.618**	0.595**	0.633**		0.583**	0.592**	0.591**	0.608**
		(2.15)	(2.26)	(2.18)	(2.28)		(2.13)	(2.17)	(2.17)	(2.24)
UNION		-1.741**	-1.825**	-1.500*	-1.471*		-1.709**	-1.713**	-1.458*	-1.420*
		(-2.15)	(-2.26)	(-1.85)	(-1.84)		(-2.08)	(-2.07)	(-1.77)	(-1.72)
PLAN_SIZE		-0.077*	-0.076	-0.091**	-0.098**		-0.075	-0.077*	-0.089**	-0.091**
		(-1.66)	(-1.64)	(-2.01)	(-2.15)		(-1.62)	(-1.65)	(-1.97)	(-1.99)
SALARY_CAP		-0.291	-0.278	-0.306	-0.308		-0.297	-0.295	-0.314	-0.288
		(-0.81)	(-0.77)	(-0.86)	(-0.85)		(-0.82)	(-0.81)	(-0.88)	(-0.81)
SALARY_AVG		0.653	0.424	0.527	0.0682		0.581	0.492	0.472	0.597
		(0.14)	(0.09)	(0.11)	(0.01)		(0.12)	(0.10)	(0.10)	(0.12)
LEVERAGE		-0.318	-0.287	-0.361	-0.343		-0.298	-0.305	-0.339	-0.269
		(-0.82)	(-0.75)	(-0.94)	(-0.90)		(-0.77)	(-0.78)	(-0.88)	(-0.70)
STDEV_OCF		-0.346	-0.223	-0.517	-0.423		-0.289	-1.110	-0.463	-0.639
		(-0.17)	(-0.11)	(-0.25)	(-0.21)		(-0.15)	(-0.54)	(-0.23)	(-0.33)
EBIT		-0.355	-0.315	-0.401	-0.413		-0.349	-0.355	-0.395	-0.380
		(-1.25)	(-1.13)	(-1.49)	(-1.52)		(-1.24)	(-1.25)	(-1.48)	(-1.45)
GROWTH		0.003	-0.023	0.025	0.016		0.003	-0.018	0.025	-0.013
		(0.01)	(-0.10)	(0.11)	(0.07)		(0.01)	(-0.08)	(0.12)	(-0.06)
BETA		0.216	0.186	0.196	0.158		0.220	0.261	0.200	0.236
		(0.76)	(0.64)	(0.69)	(0.56)		(0.77)	(0.92)	(0.71)	(0.84)
Industry Fixed Effects		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
SE Clustered by firm		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
N		1,371	1,371	1,371	1,371		1371	1371	1371	1371
Pseudo R^2		0.016	0.018	0.015	0.017		0.016	0.017	0.015	0.018

†Model cannot be estimated because there are no observations where FRS17 and CEO_MAINDB are equal to 1 simultaneously.

‡ Model is the same as in Panel A.

Notes: Table 3.6 presents the Cox regression results modeling the hazard of defined benefit pension plan part closure for the main DB plan (Panel A) and executive DB plan (Panel B). ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed). t-statistics are shown in parentheses. All variables are defined in Table 3.1.

The tables report the coefficients (β) not hazard ratios (exp(β))). Variables with positive coefficients (the β values) are associated with increased hazard and decreased survival times, i.e. as the predictor increases the hazard of the event increases and the predicted survival duration decreases. Negative coefficients indicate decreased hazard and increased survival times.

Research hypotheses are as follows:

H_1: Firms for which human capital is important are more likely to retain their DB plans, all else equal.

H_{2A}: Firms with CEO (CFO) membership in the firm's DB plan on the same terms as the rest of the employees are more likely to keep their DB plans open, all else equal.

H_{2B}: Participation of CEO (CFO) in a separate DB plan will affect a firm's decision to retain DB plans, all else equal.

H_3: Voluntary adoption of FRS 17 is associated with DB pension provision decisions, all else equal.

Table 3.7: Cox regression results (Hazard: Full DB plan closure)

	H1	H2A				H2B	
		CEO		CFO		CEO	
	BASIC	MAINDB		MAINDB		EXCLDB	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
INTANG	-6.497*	-6.780*	-6.912*	-5.869	-5.784	-6.134	-6.065
	(-1.67)	(-1.67)	(-1.69)	(-1.52)	(-1.49)	(-1.58)	(-1.58)
CEO_MAINDB/CFO_MAINDB		-1.029***	-1.269***	-0.805***	-0.951**		
		(-3.30)	(-3.30)	(-2.75)	(-2.50)		
FUNDED	-0.421*	-0.418*	-0.544*	-0.500*	-0.606**	-0.433*	-0.477*
	(-1.65)	(-1.65)	(-1.92)	(-1.86)	(-1.97)	(-1.68)	(-1.83)
CEO_MAINDB/CFO_MAINDB * FUNDED			-1.120**		-1.128***		
			(-2.40)		(-2.65)		
CEO_EXCLDB						-0.806	-1.292
						(-1.40)	(-1.50)
CEO_EXCLDB * FUNDED							-0.359
							(-0.38)
CEO_TENURE		0.027	0.028	-0.053	-0.053	0.020	0.020
		(1.01)	(1.01)	(-1.57)	(-1.58)	(0.77)	(0.78)
ACTIVE	-0.334	-0.389	-0.454	-0.521	-0.528	-0.384	-0.409
	(-0.57)	(-0.64)	(-0.73)	(-0.86)	(-0.87)	(-0.65)	(-0.69)
UNION	-0.526	-0.84	-0.833	-0.14	-0.171	-0.744	-0.702
	(-0.33)	(-0.53)	(-0.52)	(-0.09)	(-0.11)	(-0.45)	(-0.43)
PLAN_SIZE	-0.253***	-0.258***	-0.257***	-0.274***	-0.272***	-0.223**	-0.219**
	(-2.85)	(-2.81)	(-2.78)	(-3.19)	(-3.16)	(-2.42)	(-2.38)
SALARY_CAP	-0.188	-0.019	-0.007	-0.22	-0.215	-0.143	-0.152
	(-0.65)	(-0.07)	(-0.02)	(-0.81)	(-0.79)	(-0.49)	(-0.52)
SALARY_AVG	10.18	11.79	11.79	7.982	7.578	10.71	11.22
	(1.23)	(1.34)	(1.36)	(1.07)	(1.03)	(1.33)	(1.39)
LEVERAGE	1.918**	1.916**	1.934**	2.015***	1.985***	1.870**	1.871**
	(2.44)	(2.44)	(2.41)	(2.66)	(2.63)	(2.33)	(2.33)
STDEV_OCF	9.544**	9.964**	9.955**	10.96***	11.23***	9.052*	9.004*
	(2.17)	(2.12)	(2.13)	(2.81)	(2.83)	(1.95)	(1.92)
EBIT	-0.686	-0.76	-0.766	-0.810*	-0.813*	-0.72	-0.737
	(-1.45)	(-1.19)	(-1.24)	(-1.76)	(-1.76)	(-1.44)	(-1.49)
GROWTH	-0.170	-0.239	-0.186	-0.155	-0.141	-0.204	-0.221
	(-0.19)	(-0.25)	(-0.19)	(-0.19)	(-0.18)	(-0.22)	(-0.23)
BETA	0.035	-0.146	-0.149	-0.009	-0.001	0.082	0.077
	(0.09)	(-0.34)	(-0.35)	(-0.02)	(-0.00)	(0.20)	-0.18
PARTLY_CLOSED	0.392	0.284	0.279	0.308	0.309	0.449	0.464
	(1.24)	(0.89)	(0.86)	(0.94)	(0.94)	(1.50)	(1.55)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE Clustered by firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2684	2684	2684	2684	2684	2684	2684
Pseudo R^2	0.080	0.097	0.098	0.103	0.103	0.083	0.085

Notes: Table 3.7 presents the Cox regression results modeling the hazard of defined benefit pension plan full closure for the main and executive DB plan. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed). t-statistics are shown in parentheses. All variables are defined in Table 3.1.

The table shows the coefficients (β) not hazard ratios (exp(β)). Variables with positive coefficients (the β values) are associated with increased hazard and decreased survival times, i.e. as the predictor increases

the hazard of the event increases and the predicted survival duration decreases. Negative coefficients indicate decreased hazard and increased survival times.

Research hypotheses are as follows:

H_1: Firms for which human capital is important are more likely to retain their DB plans, all else equal.

H_{2A}: Firms with CEO (CFO) membership in the firm's DB plan on the same terms as the rest of the employees are more likely to keep their DB plans open, all else equal.

H_{2B}: Participation of CEO (CFO) in a separate DB plan will affect a firm's decision to retain DB plans, all else equal.

H_3: Voluntary adoption of FRS 17 is associated with DB pension provision decisions, all else equal.

Table 3.8: Cox regression results (Hazard: Pensionable salary cap)

	BASIC	CEO				CFO			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PARTLY_CLOSED	0.691***	0.685***	0.690***	0.574*	0.638**	0.688***	0.694***	0.554	0.714***
	(2.66)	(2.63)	(2.67)	(1.65)	(2.38)	(2.64)	(2.68)	(1.57)	(2.70)
FUNDED	-0.487*	-0.484*	-0.485*	-0.482*	-0.488*	-0.490*	-0.493*	-0.488*	-0.494*
	(-1.82)	(-1.82)	(-1.79)	(-1.81)	(-1.80)	(-1.84)	(-1.85)	(-1.84)	(-1.85)
CEO/CFO_MAINDB		-0.188		-0.36		-0.188		-0.381	
		(-0.88)		(-0.94)		(-0.89)		(-0.98)	
CEO/CFO_EXCLDB			0.0407		-0.651		-0.221		0.008
			(0.12)		(-0.69)		(-0.51)		(0.01)
PARTLY_CLOSED * CEO/CFO_MAINDB				0.451				0.431	
				(1.37)				(1.29)	
PARTLY_CLOSED * CEO/CFO_EXCLDB					0.814*				0.416
					(1.96)				(0.73)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE Clustered by firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2,404	2,404	2,404	2,404	2,404	2,404	2,404	2,404	2,404
Pseudo R^2	0.025	0.026	0.025	0.026	0.026	0.026	0.025	0.026	0.025

Notes: Table 3.8 presents the Cox regression results modeling the hazard of a pensionable salary cap. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level (two tailed). t-statistics are shown in parentheses. All variables are defined in Table 3.1.
The table reports the coefficients (β) (not hazard ratios (exp(β)). Variables with positive coefficients (the β values) are associated with increased hazard and decreased survival times, i.e. as the predictor increases the hazard of the event increases and the predicted survival duration decreases. Negative coefficients indicate decreased hazard and increased survival time.

Table 3.9: Descriptive statistics and tests of means for the sub-sample analysis

PANEL A: DESCRIPTIVE STATISTICS: INSIDERS SUBSAMPLE (PART CLOSURE) (N= 800)

	Average	Std. Dev.	Min	P25	Median	P75	Max
INTANG	0.019	0.094	0.000	0.000	0.000	0.007	2.012
FUNDING	0.615	0.487	0.000	0.000	1.000	1.000	1.000
CEO_INSIDERS	0.159	0.366	0.000	0.000	0.000	0.000	1.000
CFO_INSIDERS	0.290	0.454	0.000	0.000	0.000	1.000	1.000
CEO_MAINDB	0.627	0.484	0.000	0.000	1.000	1.000	1.000
CEO_EXCLUSIVE	0.081	0.273	0.000	0.000	0.000	0.000	1.000
CFO_MAINDB	0.662	0.473	0.000	0.000	1.000	1.000	1.000
CFO_EXCLUSIVE	0.104	0.305	0.000	0.000	0.000	0.000	1.000
CEO_TENURE	4.616	4.409	0.000	1.000	4.000	7.000	28.000
CFO_TENURE	5.160	4.737	0.000	2.000	4.000	7.000	22.000
ACTIVE	0.331	0.261	0.000	0.125	0.259	0.518	1.000
UNION	0.240	0.118	0.042	0.118	0.251	0.281	0.601
PLAN_SIZE	5.873	2.003	0.993	4.338	5.934	7.404	9.996
SALARY_CAP	0.060	0.238	0.000	0.000	0.000	0.000	1.000
SALARY_AVG	0.028	0.017	0.005	0.018	0.024	0.032	0.128
LEVERAGE	0.440	0.208	0.047	0.279	0.426	0.565	0.970
STDEV_OCF	0.031	0.031	0.001	0.011	0.023	0.038	0.207
EBIT	0.141	0.229	-0.547	0.048	0.094	0.160	1.279
GROWTH	0.106	0.284	-0.714	-0.010	0.073	0.165	1.446
BETA	0.927	0.270	0.039	0.750	0.940	1.090	1.960

PANEL B: DESCRIPTIVE STATISTICS: INSIDERS SUBSAMPLE (FULL CLOSURE) (N= 1627)

	Average	Std. Dev.	Min	P25	Median	P75	Max
INTANG	0.020	0.077	0.000	0.000	0.000	0.010	2.012
FUNDING	0.503	0.500	0.000	0.000	1.000	1.000	1.000
CEO_INSIDERS	0.119	0.323	0.000	0.000	0.000	0.000	1.000
CFO_INSIDERS	0.265	0.441	0.000	0.000	0.000	1.000	1.000
CEO_MAINDB	0.489	0.500	0.000	0.000	0.000	1.000	1.000
CEO_EXCLUSIVE	0.090	0.287	0.000	0.000	0.000	0.000	1.000
CFO_MAINDB	0.550	0.498	0.000	0.000	1.000	1.000	1.000
CFO_EXCLUSIVE	0.097	0.296	0.000	0.000	0.000	0.000	1.000
CEO_TENURE	5.046	5.040	0.000	2.000	4.000	7.000	28.000
CFO_TENURE	5.230	4.914	0.000	1.000	4.000	8.000	22.000
ACTIVE	0.292	0.253	0.000	0.098	0.209	0.438	1.000
UNION	0.212	0.108	0.000	0.117	0.207	0.260	0.601
PLAN_SIZE	5.802	1.932	0.993	4.289	5.817	7.152	9.996
SALARY_CAP	0.156	0.362	0.000	0.000	0.000	0.000	1.000
SALARY_AVG	0.030	0.019	0.004	0.019	0.025	0.035	0.128
LEVERAGE	0.430	0.213	0.047	0.274	0.411	0.559	0.970
STDEV_OCF	0.030	0.029	0.001	0.012	0.022	0.038	0.207
EBIT	0.136	0.215	-0.522	0.048	0.101	0.161	1.355
GROWTH	0.086	0.252	-0.714	-0.015	0.062	0.147	1.446
BETA	0.966	0.288	0.039	0.780	0.960	1.140	1.960
PARTLY_CLOSED	0.451	0.498	0.000	0.000	0.000	1.000	1.000

PANEL C: TESTS OF DIFFERENCES IN MEANS

	Partly closed sample				Fully closed sample			
	Full sample	**Insiders Subsample**	**Difference**	**t-stat**	**Full sample**	**Insiders Subsample**	**Difference**	**t-stat**
INTANG	0.014	0.019	-0.005	-1.733*	0.017	0.020	-0.003	-1.253
FUNDED	0.650	0.615	0.035	1.011	0.517	0.503	0.014	0.572
CEO_MAINDB	0.608	0.627	-0.019	-1.858*	0.498	0.489	0.009	0.033
CEO_EXCLDB	0.084	0.081	0.003	0.015	0.083	0.090	-0.007	-0.890
CFO_MAINDB	0.655	0.662	-0.007	-2.114**	0.564	0.550	0.014	0.923
CFO_EXCLDB	0.098	0.104	-0.006	-0.830	0.088	0.097	-0.009	-1.727*
CEO_TENURE	4.753	4.616	0.137	1.386	5.063	5.046	0.017	0.340
CFO_TENURE	4.762	5.160	-0.398	-1.071	4.928	5.230	-0.302	-1.437
ACTIVE	0.306	0.331	-0.025	-1.738*	0.282	0.292	-0.010	-0.980
UNION	0.245	0.240	0.005	0.026	0.219	0.212	0.007	1.697*
PLAN_SIZE	5.767	5.873	-0.106	-4.751***	5.714	5.802	-0.088	-4.982***
SALARY_CAP	0.059	0.060	-0.001	-0.204	0.156	0.146	0.010	1.168
SALARY_AVG	0.025	0.028	-0.003	-1.693*	0.028	0.030	-0.002	-2.241**
LEVERAGE	0.457	0.440	0.017	0.492	0.444	0.430	0.014	1.269
STDEV_OCF	0.032	0.031	0.001	2.729***	0.032	0.030	0.002	4.001***
EBIT	0.129	0.141	-0.012	-1.827*	0.127	0.136	-0.009	-1.845*
GROWTH	0.091	0.106	-0.015	-0.817	0.076	0.086	-0.010	-0.765
BETA	0.939	0.927	0.012	0.256	0.967	0.966	0.001	1.562
PARTLY_CLOSED					0.444	0.451	-0.007	-0.381

Notes: Table 3.9 provides descriptive statistics for the variables used in the empirical analysis for the subsample of firms. Panel A, refers to the sample of firms with partly closed DB plans; Panel B, refers to the sample of firms with fully closed plans; Panel C presents univariate tests of differences in means between the sample used in the main analysis and the subsample used in the additional analysis examining the impact of insider trustees on the decision to retain defined benefit pension plans. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed Continuous variables are winsorized at 1% and 99% to avoid the effect of any outliers. All variables are defined in Table 3.1.

Table 3.10: The role of insider trustees (Hazard: Part DB plan closure)

PANEL A: MAIN DB PLAN

	BASIC	CEO					CFO				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
CEO/CFO_TRUSTEE		-0.458*	-0.202	-0.467**	-0.482**	0.026	0.255	-0.049	0.317*	0.294	0.191
		(-1.91)	(-0.61)	(-2.08)	(-2.15)	(0.07)	(1.38)	(-0.21)	(1.74)	(1.64)	(0.52)
FUNDED	-0.004	-0.001	0.069	-0.025	-0.241	-0.125	-0.018	-0.256	-0.013	-0.597*	-0.684*
	(-0.02)	(-0.00)	(0.32)	(-0.12)	(-0.88)	(-0.45)	(-0.09)	(-0.99)	(-0.06)	(-1.95)	(-1.88)
CEO/CFO_TRUSTEE * FUNDED			-0.701*			-1.000		0.352			-0.091
			(-1.75)			(-1.62)		(1.22)			(-0.17)
CEO/CFO_MAINDB				-0.605***	-0.816***	-0.723***			-0.288	-0.724***	-0.611**
				(-3.35)	(-3.23)	(-2.60)			(-1.52)	(-3.03)	(-1.98)
CEO/CFO_MAINDB * FUNDED					-0.642**	-0.531*				-0.382	-0.515
					(-2.35)	(-1.79)				(-1.52)	(-1.48)
CEO/CFO_TRUSTEE*CEO/CFO_MAINDB						-1.312**					-0.649**
						(-2.34)					(-1.99)
CEO/CFO_TRUSTEE*CEO/CFO_MAINDB*FUNDED						-1.232**					0.041
						(-2.47)					(0.12)
CEO/CFO_TENURE		0.022	0.021	0.027	0.029*	0.027*	-0.019	-0.019	-0.020	-0.020	-0.020
		(1.27)	(1.26)	(1.63)	(1.74)	(1.67)	(-0.74)	(-0.77)	(-0.82)	(-0.83)	(-0.84)
INTANG	1.337	1.096	1.071	0.823	0.669	0.627	1.283	1.336	1.146	0.866	0.948
	(0.73)	(0.58)	(0.57)	(0.38)	(0.31)	(0.29)	(0.69)	(0.72)	(0.57)	(0.42)	(0.46)
ACTIVE	0.034	0.064	0.047	-0.057	0.013	0.027	-0.027	-0.133	-0.063	-0.167	-0.232
	(0.09)	(0.18)	(0.13)	(-0.16)	(0.04)	(0.07)	(-0.07)	(-0.33)	(-0.16)	(-0.44)	(-0.57)
UNION	-2.515*	-2.427*	-2.471*	-2.029*	-2.146*	-2.185*	-2.386*	-2.447**	-2.239*	-2.294*	-2.346**
	(-1.95)	(-1.90)	(-1.95)	(-1.68)	(-1.79)	(-1.86)	(-1.89)	(-2.02)	(-1.80)	(-1.90)	(-2.00)
PLAN_SIZE	-0.089	-0.095	-0.095	-0.091	-0.091	-0.090	-0.072	-0.068	-0.060	-0.073	-0.068
	(-1.54)	(-1.61)	(-1.63)	(-1.63)	(-1.62)	(-1.58)	(-1.22)	(-1.14)	(-1.01)	(-1.22)	(-1.15)
SALARY_CAP	-0.248	-0.215	-0.185	-0.191	-0.173	-0.139	-0.211	-0.206	-0.235	-0.172	-0.179
	(-0.50)	(-0.43)	(-0.37)	(-0.37)	(-0.34)	(-0.27)	(-0.42)	(-0.42)	(-0.47)	(-0.37)	(-0.39)
SALARY_AVG	-6.370	-3.868	-3.790	-3.940	-3.101	-2.958	-5.620	-5.447	-5.448	-5.903	-5.524
	(-0.92)	(-0.55)	(-0.54)	(-0.54)	(-0.43)	(-0.40)	(-0.81)	(-0.79)	(-0.75)	(-0.85)	(-0.81)
LEVERAGE	0.179	0.249	0.219	0.165	0.103	0.0651	0.155	0.214	0.154	0.252	0.300
	(0.31)	(0.43)	(0.38)	(0.28)	(0.17)	(0.11)	(0.28)	(0.38)	(0.27)	(0.44)	(0.53)
STDEV_OCF	-1.205	-1.520	-1.596	-0.834	-0.748	-0.687	-1.211	-1.187	-1.080	-0.785	-0.787
	(-0.43)	(-0.52)	(-0.55)	(-0.32)	(-0.29)	(-0.26)	(-0.40)	(-0.39)	(-0.36)	(-0.27)	(-0.27)
EBIT	0.314	0.375	0.353	0.418	0.393	0.386	0.324	0.398	0.314	0.328	0.382
	(0.75)	(0.92)	(0.87)	(0.99)	(0.92)	(0.90)	(0.78)	(0.96)	(0.74)	(0.77)	(0.88)
GROWTH	0.015	-0.020	-0.020	-0.015	0.010	-0.006	0.006	-0.056	0.016	0.036	-0.009
	(0.05)	(-0.07)	(-0.07)	(-0.05)	(0.04)	(-0.02)	(0.02)	(-0.18)	(0.06)	(0.12)	(-0.03)
BETA	0.193	0.177	0.183	0.043	-0.009	0.001	0.172	0.172	0.198	0.231	0.228
	(0.55)	(0.49)	(0.50)	(0.12)	(-0.02)	(0.00)	(0.48)	(0.49)	(0.56)	(0.65)	(0.65)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE Clustered by firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	800	800	800	800	800	800	800	800	800	800	800
Pseudo R^2	0.023	0.027	0.028	0.036	0.037	0.039	0.025	0.028	0.027	0.032	0.034

PANEL B: EXCLUSIVE DB PLAN

	BASIC	**CEO**					**CFO**				
	(1)‡	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
CEO/CFO_TRUSTEE		-0.458*	-0.202	-0.505**	-0.537**	-0.460	0.255	-0.049	0.285	0.274	0.083
		(-1.91)	(-0.61)	(-2.20)	(-2.34)	(-1.09)	(1.38)	(-0.21)	(1.54)	(1.54)	(0.33)
FUNDED		-0.001	0.069	0.029	0.144	0.197	-0.018	-0.256	-0.023	0.097	-0.092
		(-0.00)	(0.32)	(0.13)	(0.64)	(0.87)	(-0.09)	(-0.99)	(-0.11)	(0.44)	(-0.32)
CEO/CFO_TRUSTEE * FUNDED			-0.701*			-0.715		0.352			0.481
			(-1.75)			(-1.58)		(1.22)			(1.60)
CEO/CFO_EXCLDB				0.679***	1.189***	1.095***			0.391*	0.933***	0.992***
				(2.92)	(4.61)	(3.88)			(1.93)	(3.77)	(3.60)
CEO/CFO_EXCLDB * FUNDED					0.075	-0.056				-0.315	-0.520
					(0.14)	(-0.09)				(-0.62)	(-0.81)
CEO/CFO_TRUSTEE*CEO/CFO_EXCLDB						0.953***					0.358
						(2.63)					(0.52)
CEO/CFO_TRUSTEE*CEO/CFO_EXCLDB*FUNDED						0.152					0.277
						(0.28)					(0.35)
CEO/CFO_TENURE		0.022	0.021	0.022	0.032*	0.033*	-0.019	-0.019	-0.023	-0.025	-0.026
		(1.27)	(1.26)	(1.31)	(1.89)	(1.92)	(-0.74)	(-0.77)	(-0.90)	(-1.01)	(-1.07)
INTANG		1.096	1.071	0.736	0.524	0.369	1.283	1.336	0.922	0.548	0.718
		(0.58)	(0.57)	(0.37)	(0.26)	(0.18)	(0.69)	(0.72)	(0.47)	(0.26)	(0.34)
ACTIVE		0.064	0.047	-0.034	0.003	0.009	-0.027	-0.133	-0.023	-0.006	-0.147
		(0.18)	(0.13)	(-0.09)	(0.01)	(0.02)	(-0.07)	(-0.33)	(-0.06)	(-0.02)	(-0.36)
UNION		-2.427*	-2.471*	-2.186*	-2.288*	-2.204*	-2.386*	-2.447**	-2.302*	-2.193*	-2.334*
		(-1.90)	(-1.95)	(-1.75)	(-1.85)	(-1.81)	(-1.89)	(-2.02)	(-1.83)	(-1.80)	(-1.95)
PLAN_SIZE		-0.095	-0.095	-0.105*	-0.105*	-0.107*	-0.072	-0.068	-0.079	-0.091	-0.081
		(-1.61)	(-1.63)	(-1.79)	(-1.78)	(-1.81)	(-1.22)	(-1.14)	(-1.35)	(-1.53)	(-1.37)
SALARY_CAP		-0.215	-0.185	-0.137	-0.108	-0.070	-0.211	-0.206	-0.185	-0.226	-0.208
		(-0.43)	(-0.37)	(-0.27)	(-0.22)	(-0.14)	(-0.42)	(-0.42)	(-0.37)	(-0.45)	(-0.42)
SALARY_AVG		-3.868	-3.790	-3.111	-2.607	-1.624	-5.620	-5.447	-6.386	-6.855	-6.290
		(-0.55)	(-0.54)	(-0.45)	(-0.39)	(-0.24)	(-0.81)	(-0.79)	(-0.91)	(-0.98)	(-0.92)
LEVERAGE		0.249	0.219	0.297	0.365	0.435	0.155	0.214	0.125	0.143	0.225
		(0.43)	(0.38)	(0.52)	(0.64)	(0.75)	(0.28)	(0.38)	(0.22)	(0.26)	(0.40)
STDEV_OCF		-1.520	-1.596	-2.155	-2.051	-1.601	-1.211	-1.187	-1.875	-1.558	-1.124
		(-0.52)	(-0.55)	(-0.79)	(-0.76)	(-0.58)	(-0.40)	(-0.39)	(-0.62)	(-0.54)	(-0.39)
EBIT		0.375	0.353	0.403	0.464	0.469	0.324	0.398	0.326	0.329	0.388
		(0.92)	(0.87)	(0.99)	(1.15)	(1.19)	(0.78)	(0.96)	(0.78)	(0.79)	(0.95)
GROWTH		-0.020	-0.020	0.009	-0.028	-0.046	0.006	-0.056	-0.004	-0.001	-0.054
		(-0.07)	(-0.07)	(0.03)	(-0.09)	(-0.15)	(0.02)	(-0.18)	(-0.01)	(-0.00)	(-0.18)
BETA		0.177	0.183	0.249	0.245	0.222	0.172	0.172	0.209	0.185	0.200
		(0.49)	(0.50)	(0.68)	(0.64)	(0.57)	(0.48)	(0.49)	(0.58)	(0.51)	(0.56)
Industry Fixed Effects		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE Clustered by firm		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N		800	800	800	800	800	800	800	800	800	800
Pseudo R^2		0.027	0.028	0.032	0.036	0.037	0.025	0.028	0.026	0.031	0.033

‡ Model is the same as in Panel A.

Notes: Table 3.10 presents the Cox regressions results modelling the hazard of defined benefit plan part closure for the subsample of companies for which the names of pension plan trustees are available. Panel A shows the results for the main DB plan and panel B for the exclusive DB plan. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed). t-statistics are shown in parentheses. CEO/CFO_TRUSTEE is an indicator variable that equals 1 if the CEO/CFO is also a trustee of the pension plan and 0 otherwise. All other variables are defined in Table 3.1.

The tables report the coefficients (β) not hazard ratios (exp(β)). Variables with positive coefficients (the β values) are associated with increased hazard and decreased survival times, i.e. as the predictor increases the hazard of the event increases and the predicted survival duration decreases. Negative coefficients indicate decreased hazard and increased survival times.

Table 3.11: The role of insider trustees (Hazard: Full DB plan closure)

PANEL A: MAIN DB PLAN						
	BASIC	**CEO**			**CFO**	
	(1)	(2)	(3)	(4)	(5)	(6)
CEO/CFO_TRUSTEE		-0.620	-0.699	-0.722	0.414	0.267
		(-0.59)	(-0.71)	(-0.71)	(0.96)	(0.51)
FUNDED	-0.306	-0.296	-0.253	-0.509	-0.608*	-0.694
	(-0.94)	(-0.90)	(-0.78)	(-1.39)	(-1.75)	(-1.55)
CEO/CFO_TRUSTEE * FUNDED						0.0180
						(0.03)
CEO/CFO_MAINDB			-1.018**	-1.786**		
			(-2.20)	(-2.35)		
CEO/CFO_MAINDB * FUNDED				-0.711		
				(-1.33)		
CEO/CFO_TRUSTEE*CEO_MAINDB						
CEO/CFO_TRUSTEE*CEO_MAINDB*FUNDED						
CEO/CFO_TENURE		0.021	0.024	0.024	-0.137***	-0.137***
		(0.49)	(0.58)	(0.57)	(-2.87)	(-2.85)
INTANG	-3.211	-3.460	-4.017	-4.163	-4.142	-4.006
	(-0.73)	(-0.81)	(-0.87)	(-0.89)	(-0.84)	(-0.82)
ACTIVE	-0.274	-0.307	-0.233	-0.306	-0.414	-0.542
	(-0.31)	(-0.34)	(-0.24)	(-0.33)	(-0.45)	(-0.51)
UNION	-4.537**	-4.243**	-3.596*	-3.651*	-4.146*	-4.086*
	(-2.10)	(-1.97)	(-1.76)	(-1.79)	(-1.81)	(-1.76)
PLAN_SIZE	-0.210*	-0.191*	-0.227*	-0.220*	-0.265**	-0.259**
	(-1.87)	(-1.66)	(-1.90)	(-1.86)	(-2.40)	(-2.33)
SALARY_CAP	-0.288	-0.246	-0.121	-0.0961	-0.357	-0.364
	(-0.76)	(-0.63)	(-0.31)	(-0.25)	(-0.93)	(-0.94)
SALARY_AVG	14.34*	14.97*	13.66	13.62	8.915	9.380
	(1.73)	(1.85)	(1.52)	(1.55)	(1.16)	(1.21)
LEVERAGE	2.275**	2.236**	2.223**	2.138**	2.203*	2.181*
	(2.00)	(1.98)	(2.04)	(1.97)	(1.94)	(1.89)
STDEV_OCF	10.74**	10.26**	9.169**	9.208**	12.66***	12.69***
	(2.44)	(2.23)	(2.06)	(2.06)	(2.93)	(2.89)
EBIT	-0.728	-0.684	-0.532	-0.540	-0.865*	-0.841
	(-1.36)	(-1.14)	(-0.82)	(-0.86)	(-1.67)	(-1.60)
GROWTH	0.591	0.551	0.598	0.762	0.536	0.538
	(0.62)	(0.55)	(0.60)	(0.76)	(0.62)	(0.61)
BETA	-0.169	-0.167	-0.601	-0.078	-0.315	-0.288
	(-0.31)	(-0.31)	(-0.59)	(-0.14)	(-0.61)	(-0.57)
PARTLY CLOSED	-0.127	-0.085	-0.230	-0.287	-0.416	-0.429
	(-0.29)	(-0.21)	(-0.54)	(-0.65)	(-1.00)	(-1.02)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
SE Clustered by firm	Yes	Yes	Yes	Yes	Yes	Yes
N	1627	1627	1627	1627	1627	1627
Pseudo R^2	0.096	0.098	0.113	0.120	0.125	0.126

PANEL B: EXCLUSIVE DB PLAN

	BASIC	CEO			CFO	
	(1)‡	(2)	(3)	(4)	(5)	(6)
CEO/CFO_TRUSTEE		-0.620	-0.562	-0.555	0.414	0.267
		(-0.59)	(-0.53)	(-0.52)	(0.96)	(0.51)
FUNDED		-0.296	-0.349	-0.432	-0.608*	-0.694
		(-0.90)	(-1.03)	(-1.27)	(-1.75)	(-1.55)
CEO/CFO_TRUSTEE * FUNDED						0.018
						(0.03)
CEO/CFO_EXCLDB			-0.723	-1.258		
			(-1.31)	(-1.43)		
CEO/CFO_EXCL * FUNDED				-0.082		
				(-0.09)		
CEO/CFO_TRUSTEE*CEO_EXCLDB						
CEO/CFO_TRUSTEE*CEO_EXCLDB*FUNDED						
CEO/CFO_TENURE		0.021	0.022	0.022	-0.137***	-0.137***
		(0.49)	(0.50)	(0.52)	(-2.87)	(-2.85)
INTANG		-3.460	-3.276	-3.175	-4.142	-4.006
		(-0.81)	(-0.78)	(-0.77)	(-0.84)	(-0.82)
ACTIVE		-0.307	-0.333	-0.348	-0.414	-0.542
		(-0.34)	(-0.37)	(-0.38)	(-0.45)	(-0.51)
UNION		-4.243**	-4.464*	-4.255*	-4.146*	-4.086*
		(-1.97)	(-1.94)	(-1.88)	(-1.81)	(-1.76)
PLAN_SIZE		-0.191*	-0.167	-0.161	-0.265**	-0.259**
		(-1.66)	(-1.42)	(-1.39)	(-2.40)	(-2.33)
SALARY_CAP		-0.246	-0.238	-0.264	-0.357	-0.364
		(-0.63)	(-0.61)	(-0.69)	(-0.93)	(-0.94)
SALARY_AVG		14.97*	15.73**	16.53**	8.915	9.380
		(1.85)	(1.97)	(2.06)	(1.16)	(1.21)
LEVERAGE		2.236**	2.172*	2.191*	2.203*	2.181*
		(1.98)	(1.91)	(1.91)	(1.94)	(1.89)
STDEV_OCF		10.26**	10.38**	10.39**	12.66***	12.69***
		(2.23)	(2.24)	(2.18)	(2.93)	(2.89)
EBIT		-0.684	-0.686	-0.722	-0.865*	-0.841
		(-1.14)	(-1.14)	(-1.24)	(-1.67)	(-1.60)
GROWTH		0.551	0.518	0.501	0.536	0.538
		(0.55)	(0.53)	(0.49)	(0.62)	(0.61)
BETA		-0.167	-0.123	-0.148	-0.315	-0.288
		(-0.31)	(-0.22)	(-0.27)	(-0.61)	(-0.57)
PARTLY_CLOSED		-0.086	-0.029	-0.011	-0.416	-0.429
		(-0.21)	(-0.07)	(-0.03)	(-1.00)	(-1.02)
Industry Fixed Effects		Yes	Yes	Yes	Yes	Yes
SE Clustered by firm		Yes	Yes	Yes	Yes	Yes
N		1627	1627	1627	1627	1627
Pseudo R^2		0.098	0.101	0.104	0.125	0.126

‡ Model is the same as in Panel A.

Notes: Table 3.11 presents the Cox regressions results modelling the hazard of defined benefit plan full closure for the subsample of companies for which the names of pension plan trustees are available. Panel A shows the results for the main DB plan and Panel B for the exclusive DB plan. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed). t-statistics are shown in parentheses. All variables are defined in Table 3.1.

The tables report the coefficients (β) not hazard ratios (exp(β)). Variables with positive coefficients (the β values) are associated with increased hazard and decreased survival times, i.e. as the predictor increases the hazard of the event increases and the predicted survival duration decreases. Negative coefficients indicate decreased hazard and increased survival times.

Chapter 4: Economic Effects of DB Plan Retentions

4.1 Introduction

The aim of this chapter is to explore the potential impact of DB plan retentions and of chief executive officers' (CEOs) participation, on credit ratings as well as firms' dividend policy and investment decisions. In particular, I examine the potential consequences of DB plan retentions and CEO membership on firms' credit ratings. Moreover, I investigate whether CEOs' participation in the firm's main DB plan can influence the dividend policy and investment decisions given that CEOs can affect the riskiness of corporate decisions (Core, Guay & Larcker, 2003). Specifically, in chapter 3, I find that if CEOs participate in a firm's main DB plan as the rest of the employees then these firms are more likely to retain DB plans, either partially or fully open irrespective of whether these plans are underfunded or overfunded. In this chapter, I explore the impact of the decision to retain DB plans on credit ratings and also how this affects dividend policies and capital investment decisions. In particular, if a firm retains its DB plan then the associated risk will continue to increase (e.g. inflation risk, longevity risk, investment risk etc.) and as a result the cost to the firm will be higher. Moreover, the costs will be even higher for a firm that retains its DB plan for existing and new employees rather than retaining the DB plan for existing employees only. On the other hand, if a firm closes its DB plan, it is expected to save on costs related with these schemes. For example, Rauh, Stefanescu and Zeldes (2013) show that after freezing DB plans, US firms save 3.1% of total firm assets over a 10-year horizon. However, for a firm that is performing well, pensions and especially DB plans constitute a significant part of deferred compensation and as such positive effects of those plans might offset the associated costs of retaining them. Existing literature examines the effects that DB plan freezes have on stock markets and finds that that firms that terminate their DB plans exhibit positive abnormal returns (e.g. Rubin, 2007; Milevsky and Song, 2010). However, this literature does not directly address DB retention. In addition, although these studies provide evidence on the effect that pension disclosure has on stock markets, Holthausen and Watts (2001) argue that the information that is value relevant for equity holders is not necessarily relevant for debt holders. Corporate credit ratings

are vital aspects of a firm's financial reputation and its capital structure (e.g., Sufi, 2007; Kisgen and Strahan, 2010). Adverse changes in these ratings can increase the cost of borrowing and can yield direct negative effects on the firms' cash flows not only through public markets but also through the use of performance-pricing provisions in private loan contracts (e.g., Beatty and Weber, 2003; Kraft, 2014). Moreover, prior research has focused extensively on the effect of quantitative factors such as firm characteristics and accounting information in the credit rating process (Kaplan and Urwitz 1979, Blume, Lim and Mackinlay, 1998). However, Standard and Poor's (S&P) stresses that although quantitative models are used to evaluate some of these criteria, qualitative adjustments are also made where necessary (S&P, 2011). In particular, among other things, they focus on entity specific characteristics such as operational effectiveness, financial policies, risk management practices, and risk tolerance (S&P, 2011). Despite this fact, the role of management incentives has been largely unexplored. For example, managers' potential opportunities to develop firms' strategies, operational effectiveness as well as financial policies and risk management strategies make them an important factor to examine in debt markets. One study examining the effect of managerial incentives on credit ratings is Kuang and Qin (2013), which tests whether managerial risk-taking incentives impact credit ratings. In particular, Kuang and Qin (2013) find that increases in management risk-taking incentives (i.e., vega and delta) are associated with lower ratings (i.e., higher default risk).

In this context, I examine the effect of DB plan retentions on firms' credit ratings. I find that firms which continue to sponsor DB plans are more likely to be awarded lower credit ratings. This result holds for both fully and partially open DB plans and it is exacerbated when these plans are underfunded. Moreover, I find that if the CEO is a member of the DB plan, this effect is offset and can positively affect credit ratings. These results suggest that open DB plans are considered to increase firms' default rate which seems plausible due to risks associated with them. However, when CEOs are members of these plans the expected probability of default decreases and this might be because credit rating agencies take into consideration the fact that these CEOs remain members of these plans; this might itself signal that these are relatively healthy plans. In addition, prior literature shows

that CEOs that are members of DB plans are relatively more likely to be risk averse with regards to corporate financial decisions (Sundaram and Yermack, 2007; Cassell, Huang, Sanchez and Stuart, 2012).

Existing literature shows that funds required for pension plans might restrict funds that could be allocated for other uses within the firm (e.g. Rauh, 2006; Liu and Tonks, 2013). Another stream of literature documents the importance of DB plans as part of CEOs compensation and how this can affect their incentives (e.g. Bebchuk and Jackson, 2005; Frydman and Jenter, 2010; Sundaram and Yermack, 2007; Cadman and Vincent, 2015). Building on this literature, I analyse the effect that CEO participation in the main DB plan has on dividend and investment decisions when firms continue to sponsor these plans while controlling for the funding status of the plan. I find that participation of CEOs in the main DB plans combined with the pension plans being overfunded negatively affect investment decisions if these schemes remain open. I do not find any evidence of dividend cuts which may be explained by the market signalling implications of dividends. Dividend signalling models typically predict that unexpected changes in dividends convey information regarding the level of current and future cash flows (Lintner, 1956). As such the board of directors seeks to establish dividend policies that are unlikely to require year by year changes. Lintner (1956) concludes that no other decision made by the board of directors was considered as consistently important (i.e. year-by-year) as the dividend policy.

This chapter contributes to the literature in several ways. First, it is the first study, to the best of my knowledge, to directly examine the economic effects of DB plan retentions and CEO participation on credit ratings. Given the magnitude of DB plans and the significant effect of credit ratings in firms' financial reputation, it is essential to understand the impact that decisions related to DB plans have not only on the stock market but on credit ratings as well. Moreover, I contribute to the emerging literature on the sophistication of credit rating agencies in incorporating complex entity qualitative characteristics into their credit rating evaluation (e.g. Lee, 2008; Ashbaugh-Skaife et al., 2006; Bradley and Chen, 2011; Kuang and Qiu, 2013). Prior research investigates the sophistication of rating agencies in incorporating complex accounting information on credit risk assessments. For example,

disclosures of employee stock options (Lee, 2008), corporate governance quality on credit rating evaluation (Ashbaugh-Skaife et al., 2006; Bradley and Chen, 2011); and managerial risk-taking incentives (Kuang and Qiu, 2013). My study advances our understanding of the rating process from the perspective of managerial compensation incentives and DB pension plans in particular. My findings may also have implications on the role of accounting in restraining (or encouraging) managerial risk taking with improved disclosures on managerial compensation. Second, the present study extends findings of the literature on the impact of executives' compensation on firms' decisions (e.g. Core and Guay, 1999; Rogers, 2002; Coles et al., 2006) and it contributes to the growing literature on the agency effects of inside-debt compensation. Contrary to existing, mainly US based studies, I examine the importance of tax qualified DB plans and find that CEOs who are members of the main DB plan are more likely to adjust corporate investments rather than to dividends in order to protect the pension plans.

The remainder of the paper is organised as follows: Section 4.2 discusses the literature review and the hypotheses development; Section 4.3 presents the research design; Section 4.4 describes the sample selection process and descriptive statistics; Section 4.5 discusses the empirical findings and section 4.6 provides additional analysis; finally, section 4.7 concludes.

4.2 Literature review and research objectives

There are three streams of literature relevant to this study. The first is the literature analysing the value relevance of pension plan information to equity markets and to credit rating agencies; the second refers to studies that examine the effect that decisions related to pension funding have on other corporate decisions such as investment and dividends; finally, the third refers to studies that examine the importance of CEO pension incentives. The following subsections discuss each stream of the literature and develop the research questions to be addressed in this study.

4.2.1 Effects of DB plan retention on credit ratings

Value-relevance studies investigate whether financial statement information is decision-useful to capital market participants as intended by standard-setters (Glaum, 2009). Usually these studies attempt to measure whether financial statement data are reflected systematically in stock market valuations. Existing literature, mainly US based, provides mixed results regarding the relevance of pension information to the stock markets (Barth et al., 1993; Coronado and Sharpe, 2003; Coronado et al., 2008; Franzoni and Marin, 2006; Picconi, 2006; Hann, Heflin and Subramanyam, 2007; Fasshauer and Glaum, 2012). Similar to this line of research a few studies also analyse the stock market effects of DB pension plan freezes. In particular, those studies use event studies and measure the abnormal returns after the announcement date of the termination. For example, Rubin (2007) examines DB freeze announcements in the US for the period 2003-2006 (14 announcements) and finds that freezes enhance firm value but that market valuation lags in responding to this increase, which according to the author suggests that markets are not semi-strong efficient with respect to pension freezes. In a related study, Milevsky and Song (2010) examine 75 freeze announcements in the US and find that firms that terminate their DB plans exhibit a positive abnormal return. Moreover, the abnormal return is greater for firms with higher beta and/or lower return on equity prior to the freeze. The authors suggest that the positive impact is more pronounced for firms that are likely to face financial distress if they maintain their traditional pension plan and the associated long-term promises. More recently, Choy, Lin and Officer (2014) examine the impact of DB plan hard freezes on the firm's risk and risk-taking activities. The authors use a sample of US firms during the period 2002-2007 and find that firms that declare a hard freeze experience an increase in total risk, measured as the standard deviation of returns. Moreover, the study finds that yields on bonds issued by firms that that hard freeze their DB plans also increase, consistent with the increase in risk. The authors also note an increase in risk taking activities. In particular, they observe a shift from capital expenditures to riskier R&D projects after the freeze. Taken together their findings suggest that DB plans are a form of internal debt that aligns manager's and bondholder's interests.

Another stream of literature examines the value relevance of pension information to credit ratings. Early studies (late 1970s and early 1980s) on credit relevance of pension information in the US provide only weak results (Martin and Henderson, 1983 and Maher, 1987). Martin and Henderson (1983) use a US sample during 1979-1980 period, to examine traditional ratios and Employee Retirement Income Security Act (ERISA) - modified measures to see if the inclusion of the ERISA data helps predict bond ratings. The authors use rank discriminant analysis (RDA) methodology and along with traditional bond predicting ratios they include five ERISA measures suggested by Moody's. They find that including ERISA measures seems to improve credit rating prediction and the prediction improvement is greater at the low end of the credit ratings. The authors argue that this suggests that if a firm has ERISA problems along with other financial problems, they both help forecast a low bond rating and the traditional ratios alone are less discriminating. However, the authors emphasize that given data availability issues, these results are unreliable and further research is required when additional data become available. Likewise, Maher (1987) uses a sample of US firms during 1980-1982 to examine whether net pension variables have predictive power in credit ratings. The study uses the SFAS No. 36 pension footnote disclosures to develop several measures of the net pension obligation (asset) such as the pension liability actually reported in the firm's annual report as well as recalculated obligations based on cross-sectionally standardised interest discount rates. The author finds that the pension disclosures as required by SFAS 36 were not significant in predicting credit ratings in any of the years. In addition, pension specific measures calculated using standardised interest rates are predictive of credit ratings in 1981 and 1982 but not in 1980. These findings suggest that credit rating analysts could see through the use of high interest rates to decrease the reported pension obligation by some companies. Later studies however document a stronger association between pension information and credit ratings. For example, Carroll and Niehaus (1998) using US data for the period 1987–1994, find that accounting information on pension assets and liabilities significantly influence bond ratings. More specifically they find that unfunded pension liabilities decrease debt ratings more than an equivalent amount of excess pension assets increase debt ratings. Hann et al., (2007) using a sample of US firms for the period

1991 to 2002 also examine the relative credit-relevance of smoothed SFAS 87 accounting measures and fair-value pension measures. They find no statistical difference in the explanatory power of smoothed SFAS 87 pension provisions and fair-value pension provisions. Cardinale (2007), rather than using credit ratings as previous studies, uses credit spreads for US corporate bonds to examine whether unfunded pension liabilities are associated with credit spreads. Based on data for more than 12,000 'bond-years', he finds that the size of the unfunded pension liability, scaled by company value, is significantly associated with bond spreads.

In summary, existing literature provides empirical evidence that credit rating agencies consider pension liabilities. In addition, anecdotal evidence suggests that US credit rating agencies revised their expectations about pension obligations during the adverse market conditions in 2001-2002. The two biggest credit rating agencies, Moody's and Standard & Poor's, issued reports in 2003 suggesting that traditional leverage ratios should be adjusted to take into consideration unfunded retirement obligations (Cardinale, 2007). In addition, there are companies' examples during that period that support an association between downgrades and unfunded pension liabilities (e.g. General Motors Corporation, Ford Motor Company, in the United States, Rolls-Royce in the United Kingdom, and ThyssenKrupp, Deutsche Poste, and Linde in Germany) (Cardinale, 2007).

I build on this literature and analyse the effect of DB plan retention on corporate bond ratings. In particular, if a firm retains its DB plan it is plausible to assume that the risks associated with this plan will increase due to the obligation to provide a guaranteed payout of a specific amount of benefits for the life of employees upon their retirement. Moreover, these risks will tend to be higher for fully open plans as compared to schemes that are open only to existing members. Under these terms, I expect the retention of DB plans to have a negative impact on credit ratings. On the other hand, it is not always possible to assume a negative impact. For a firm that is performing well, especially a firm that operates in a knowledge intensive industry, offering a high calibre pension plan might constitute an important compensation component. Pensions in general and especially DB plans are a significant part of deferred employee compensation. As such, companies use them

as a means to attract and retain high quality employees. Given these two contrasting perspectives, it is of interest to analyse the effect that DB plan retention has on firm credit rating. Furthermore, given the executives' personal incentives related to pension plans, this effect may also be influenced by the fact that the firm's CEO is a member of the firm's tax qualified DB plan. Existing literature has shown that pensions are an important part of CEO compensation and evidence suggests that CEOs with high pension holdings are more risk averse (e.g. Bebchuk and Jackson, 2005, Sundaram and Yermack, 2007; Gerakos, 2007; Wei and Yermack, 2009). In particular, the manner by which CEOs do so may involve some combination of reducing investment spending, selecting less risky projects, unlevering the firm's capital structure, or lengthening the maturity of the firm's debt (Sundaram and Yermack, 2007). Moreover, Kuang and Qin (2013) examine whether credit rating agencies incorporate managerial risk-taking incentives into their credit risk assessment. They use two proxies to measure risk-taking incentives: the sensitivity of managerial wealth to stock return volatility (vega) and the sensitivity of managerial wealth to stock price (delta). Using a sample of US firms from 1992 to 2006 the authors find that credit rating agencies incorporate managerial risk-taking incentives in their credit risk assessments. However, existing literature does not provide any evidence so far on how the participation of CEOs in the firms' main DB pension plan might affect credit ratings. The most closely related study is the one by Moody's (2005) which analyses the relation between credit ratings and CEO compensation for a sample of US firms between 1993 and 2003. They find that that large, positive, unexplained bonus and option awards can predict default and substantial rating downgrades while variations in salaries do not predict credit risk. Although these results do not provide a direct explanation on why CEO compensation might predict credit ratings, the authors suggest that high levels of unexplained compensation may indicate a weaker board which as a result, does not put any pressure on executives to provide good financial performance. Another study that is indirectly related to this one is a paper by Ashbaugh-Skaife et al., (2006). The study analyses the effect of corporate governance quality on credit ratings. The authors find that corporate governance affects credit ratings. They subsequently examine the reasons why all firms do not have strong governance. Their findings suggest that CEOs of weak

governance firms garner overcompensation in excess of their share of additional debt costs. Moreover, Bonsall, Holzman and Miller (2016) examine the effect of managerial ability on credit rating valuation. Using a sample of US firms from 1985 to 2011 they find that higher managerial ability is associated with more favourable credit ratings. Nevertheless, these studies do not provide any direct evidence related to CEO pension compensation and its effect on credit ratings. This remains an empirical research question to which I seek to shed more light.

4.2.2 Financial constraints and pension underfunding

Modigliani and Miller (1958) theorise that in a world without frictions there are no differences between the cost of internal and external financing. Further research suggests that external funding might be more expensive because of information asymmetry, moral hazard problems, incomplete contracting agency costs and the tax systems. These ideas have often been synthesized into the trade-off theory and the pecking order theory of leverage (Donaldson, 1961; Kraus and Litzenberger, 1973; Myers, 1984; Myers and Majluf, 1984).

The trade-off theory of capital structure refers to the idea that a company chooses how much debt finance and how much equity finance to use by balancing the costs and benefits. Kraus and Litzenberger (1973) provide a classic statement of the theory that optimal leverage reflects a trade-off between the tax benefits of debt and the deadweight costs of bankruptcy. According to Myers (1984), a firm that follows the trade-off theory sets a target debt-to-value ratio and then gradually moves towards the target. The target is determined by balancing debt tax shields against costs of bankruptcy.

The pecking order theory initially proposed by Donaldson (1961) and modified later by Myers and Majluf (1984) suggests that due to adverse selection, companies prioritise their sources of funding based on their risk level. More specifically, internal financing is prioritised followed by the issue of debt and finally by issuing new equity. This pecking order is important because it signals to the market how the company is performing. If a company uses internal finance, this will generally mean that the firm is financially strong. If a firm issues new debt, it is a signal that management is

confident the company can meet its debt obligations. If a company issues new equity, it is normally a negative signal, as the company thinks its stock is overvalued and it seeks to profit before a fall in the share price. Moreover, Shyam-Sunder and Myers (1999) using a sample of 157 publicly traded US firms over the period 1971 to 1989 find strong support for this prediction.

A firm that sponsors a DB plan promises employees future pension benefits. This liability is generally measured based on the years of service of the employees and on their salary levels (Glaum, 2009). Thus, the firm has a financial liability toward retirees equal to the present value of the estimated benefits. In the UK, the Pensions Regulator requires firms to fund the liability in a pension fund with dedicated assets. If the market value of pension plan assets is greater than the present value of liabilities, the plan is considered “overfunded”. If the market value of pension assets is less than the present discounted value of the pension liability, the scheme is considered “underfunded”. Firms with overfunded plans do not have to make contributions to their pension funds. They may choose to make contributions but only up to certain full funding limits, beyond which contributions lose their favourable tax treatment. If the plan is underfunded, the firm is required to make contributions in order to meet a statutory funding objective (The Pension Regulator). Thus, contributions to underfunded plans can pose a significant financial pressure (Rauh, 2006). The existence of budget constraints within firms implies that such contributions to the pension scheme can divert cash from alternative uses such as dividend payments or investments (Bunn and Trivedi, 2005; Rauh, 2006; Liu and Tonks, 2013). The implication of the trade-off theory is that an increase in pension contributions should not affect the optimal level of debt; therefore one might expect adjustment to higher pension contributions to take place through lower dividends and possibly lower investment (or higher equity issuance). The implication of the ‘pecking order’ theory is that if pension contributions increase, unless they are fully offset by lower dividends or investments, a firm will have less internal finance available to finance investment and they will increase their demand for external finance. This may mean that firms take on more debt, although if external financing is costly and thereby leads to an increase in the cost of capital, investment will be lower than it would otherwise have been (Bunn and Trivedi, 2005).

Existing literature, mainly US based, shows that funds required to finance pension plans might restrict how much could be allocated for other uses within the firm. For example, Rauh (2006) using a sample of US firms that sponsor DB plans over the period 1991-2004, finds that mandatory pension contributions have a negative effect on firms' capital expenditures. This effect is more evident when firms are more financially constrained. The author also finds a negative relation between pension plan contributions and acquisitions, dividends and stock repurchases.

Another stream of literature examines the capital market effects of pension contributions. Franzoni and Marin (2006) use a US sample from 1981 to 2002 and show that firms with overfunded plans tend to be under-priced, while firms with underfunded plans are significantly overpriced. The authors suggest that this pricing anomaly does not have a risk-based explanation. As an alternative, they suggest an interpretation based on investors' under-reaction to pension plan information. Franzoni (2009) finds a negative association between mandatory pension contributions and stock returns over the subsequent twelve months for a sample of US firms from July of 1991 and June of 2001. This association is stronger for firms that are more financially constrained. Likewise, Campbell, Dhaliwal, and Schwartz (2010) examine the relationship between capital expenditures and abnormal returns surrounding key dates in the legislative process that led to the adoption of the Pension Protection Act of 2006 (PPA 2006). Using the PPA 2006 as an exogenous shock to examine the market reaction to increased mandatory pension contributions, they find that firms with greater investment requirements (i.e., firms with higher levels of capital expenditures prior to the PPA 2006) are associated with added negative abnormal returns than are firms with relatively smaller investment requirements. Campbell, Dhaliwal and Schwartz (2012) examine the relation between firms' weighted average cost of capital (WACC) and internal financial resources, using mandatory pension contributions as a proxy for internal financial resources for a sample of US firms over the period 1991–2007. They find a positive association between firms' WACC and mandatory pension contributions for firms that issue non-investment grade debt but no such relationship for firms that issue investment-grade debt suggesting that mandatory pension contributions increase the cost of capital, but only for firms that face greater external financing constraints. In addition, the

study shows that Moody's credit ratings are not significantly related with mandatory pension contributions.

There are only two studies that use a UK setting to examine these issues. Bunn and Trivedi (2005), using a sample of publicly traded UK firms for the period over 1983-2002 find significant evidence that increased pension contributions are associated to lower dividend payments while they find only weak evidence that this relation holds for investments. In other words, companies that are required to divert funds to their underfunded pension plans tend to pay lower dividends than they would otherwise. In a similar study, Liu and Tonks (2013) using a sample of UK-listed firms with at least one DB pension scheme from 2001 to 2005, find a strong and negative relation between pension contributions and capital expenditures and dividend payments.

In general, these studies suggest that firms with underfunded pension plans tend to pay fewer dividends and undertake fewer investments than they would otherwise. In addition, these results are consistent with the notion that capital markets react as if increases in mandatory pension contributions require firms to forego valuable capital investments.

4.2.3 CEO incentives

The agency theory of Jensen and Meckling (1976) postulates that non-owner managers (agents) may adopt corporate decisions serving their own interests to the detriment of shareholders' interests. Based on these concepts subsequent literature has identified several reasons for managers to deviate from decisions that optimise shareholders value. More specifically, several studies show that undiversified wealth and human capital invested in the firm may lead risk-averse managers to make sub-optimal decisions to reduce firm risk (e.g. Jensen and Meckling, 1976; Treynor and Black, 1976; Parrino, Poteshman and Weisbach, 2005; etc.). The empire-building hypothesis (Jensen, 1986) suggests that managers might undertake unprofitable investments to increase the size of the company. The motivation to construct an 'empire' reflects the executives' desire to achieve higher status, more power and prestige in society. This can lead to over-investment that, in turn, reduces

shareholder value (Marris 1964; Williamson 1974; Jensen 1986). Reputation issues might be another explanation why managers act in their own interest (Jensen and Meckling, 1976; Amihud and Lev, 1981; Eisenhardt, 1989, Schleifer and Vishny, 1988). Compensation is an additional important incentive that might lead managers to act against shareholders' interests. Existing literature examining the effects of various compensation components emphasizes primarily the role of equity-based compensation. For example, Coles, Daniel, and Naveen (2006) show that executives prefer highly risky investments if the value of their compensation package, particularly stock-option holdings, is positively related to firm risk.

In the context of pensions, DB pension plans are considered a form of inside debt[56] and like other types of debt, inside debt obligations expose managers to default risks (Edmans and Liu, 2010). Jensen and Meckling (1976) suggest that possible excessive inside debt holdings, may prompt executives to make more conservative decisions by reducing the overall risk and restraining liquidity and thereby transferring wealth from stockholders to debtholders. Although inside debt holdings constitute a significant part of executives' compensation (e.g. Bebchuk and Jackson, 2005), pensions do not receive the necessary attention in the empirical compensation literature as it is highlighted by Jenter and Frydman (2010) in their review of recent compensation research. In addition, a few US based studies on this matter mainly refer to Supplemental Executive Retirement Plans (SERPs). These plans were established for the pension payments which exceeded the maximum federally-insured amounts available to most employees under ordinary tax-qualified pension plans. SERP pension liabilities represent unsecured, unfunded debt held by executives against the firm, and should the firm become insolvent, SERP pension beneficiaries would stand in line with other creditors. This type of pension plan is similar to Employer-Financed Retirement Benefits Scheme (EFRBS) (or EFURB) established in the UK for pension payments which exceeded the maximum lifetime allowance.[57] In either case, there is no corporation tax deduction for employer contributions to an EFRBS scheme on the basis that it involves no 'qualifying benefit'.

[56] They represent fixed obligations to be paid to company insiders.
[57] Employer Financed Retirement Benefit Schemes (EFRBS) replaced Funded Unapproved Retirement Benefit Schemes (FURBS) or Unfunded Unapproved Retirement Benefit Schemes (UURBS) after A-day (6 April 2006).

In addition, executives do not face an income tax liability until payments are received. However, while in the US the majority of executives' pension benefits are accrued through SERPS in the UK, the proportion of benefits accrued under non-supplemental schemes (i.e. EFRBS) does not typically comprise the majority of executive pension benefits (Goh et al., 2015). As such, most of the existing US studies in general fail to consider the importance of qualified DB plans.

Sundaram and Yermack (2007) use a sample of 237 Fortune 500 firms over the period 1996 to 2002 and find that SERPS are a significant part of executives' compensation and that debt-based compensation prompts managers to be more conservative in managing pension plans. Similarly, Cassell, et al. (2012) examine a sample of US firms over the period 2006 to 2008, to see whether CEOs with large inside debt holdings protect the value of their holdings by implementing less risky investment decisions and financial policies. They find a negative association between CEO inside debt holdings and R&D expenditures and financial leverage and a positive relation between executive inside debt holdings and diversification and asset liquidity. They interpret their results as evidence that large inside debt holdings induce a decrease of risk-seeking behaviour. Likewise, Eisdorfer, et al. (2015) use a sample of US firms for the period 2000 to 2009 and investigate the effect that executive SERPs have on dividend policy. They find a negative association between SERPs and dividends. Particularly, they show that firms maintain a relatively low dividend yield and dividend payout ratio when the proportion of pension value in the executives' compensation package is high, and when the pension value represents a high fraction of the firm assets. In a similar line of research, Wei and Yermack (2011) examine investor reactions to CEOs' initial reports of inside debt positions required by SEC's reforms in 2007. They find that for firms whose CEOs have large DB plans or other deferred compensation, bond prices rise, and equity prices fall in response to the disclosure in 2007. They interpret their results as evidence that inside debt is used to align managerial incentives with those of outside creditors.

Overall, the evidence strengthens the theoretical argument that inside debt alleviates agency costs of debt and supports the fact that excessive amounts of inside debt holdings lead to CEOs making more conservative decisions. Above, I

discussed studies which suggest that firms with underfunded pension plans tend to pay less dividends and undertake fewer investments than they would otherwise. In addition, in chapter 3, I find that CEOs that participate in the firms' main DB plan are more likely to retain these plans. In this chapter, I combine these two streams of literature and findings in chapter 3 and examine the effect of CEO participation in the firm's qualified DB plan on decisions related to dividend and investment outlays while controlling for the funding status of the pension plan. From earlier analysis, I infer that if CEOs are members of the firms' main DB plans then these CEOs are more likely to retain the DB plans open even if these plans are underfunded. Existing literature shows that there is a negative association between the funds required for pension plans and funds required for other activities such as dividends and investments. An interesting research question that then arises is: how does the presence of a CEO affect/alters this relationship? If CEOs are only interested in serving their own interests, then one would expect that they would adjust dividends and investments in order to fund their own pension plan. However, the decision to cut dividends is not easy because of the signalling implications to the market (Lintner, 1956). More specifically, Lintner (1956) shows that dividend policy exhibits inertia and conservatism because of a deep belief by board directors that shareholders prefer stability, with equity markets placing a premium on stability and gradual growth. As such, the board of directors seeks to establish dividend policies that are unlikely to require year by year changes. Avoiding inconsistent changes to dividend policy can be achieved by changing dividends in line with changes in earnings forecasts. In addition, Lintner (1956) concludes that no other decision made by the board of directors was considered as consistently important (i.e. year-by-year) as dividend policy.

In a summary of Lintner's findings, Marsh and Merton (1987) conclude that managers tend not to make dividend decisions that might have to be reversed in the near future and they mainly focus on the change in existing dividend payout level rather than absolute level. Furthermore, agency theory posits that dividends encourage managers to more efficiently use available resources (Jensen, 1986). As such, dividends serve as a disciplining and monitoring mechanism intended to reduce the agency costs of equity. Given the role of dividends, there may be a need

for adjustment through other channels as well as dividends. Another channel in which adjustments may take place is through corporate investments. That is, in order to retain necessary funds for their DB plans, managers may decide to cut investments and thereby potentially underinvest. Therefore, examining the effect of CEO participation in the firm's main DB plan on dividend payments and investments represents an interesting research question.

4.3 Research Design

In this section, I present the research design for the analysis of the effects of DB plan retention and CEO participation in them on credit ratings and the effects on dividends and capital investments, respectively.

4.3.1 Effects on credit ratings

To examine the effect that the retention of DB plans has on credit ratings, I use ordered probit models. I use ordered probit models because the eight categories of credit ratings convey ordinal risk assessment. The models are as follows:

$$RATING_{it} = \beta_0 + \beta_1 (FUNDED_{it}) + \beta_2 (FULLY\_OPEN_{it}) + \beta_3 (PARTLY\_OPEN_{it}) + \beta_k (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.1)$$

$$RATING_{it} = \beta_0 + \beta_1 (FUNDED_{it}) + \beta_2 (FULLY\_OPEN_{it}) + \beta_3 (PARTLY\_OPEN_{it}) + \beta_4 (FUNDED_{it} * FULLY\_OPEN_{it}) + \beta_5 (FUNDED_{it} * PARTLY\_OPEN_{it}) + \beta_k (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.2)$$

$$RATING_{it} = \beta_0 + \beta_1 (FUNDED_{it}) + \beta_2 (FULLY\_OPEN_{it}) + \beta_3 (PARTLY\_OPEN_{it}) + \beta_4 (CEO\_MAINDB_{it}) + \beta_k (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.3)$$

$$RATING_{it} = \beta_0 + \beta_1 (FUNDED_{it}) + \beta_2 (FULLY\_OPEN_{it}) + \beta_3 (PARTLY\_OPEN_{it}) + \beta_4 (CEO\_MAINDB_{it}) + \beta_5 (CEO\_MAINDB_{it} * FULLY\_OPEN_{it}) + \beta_6 (CEO\_MAINDB_{it} * PARTLY\_OPEN_{it}) + \beta_k (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.4)$$

To proxy for firm credit ratings (RATING), I use the long-term issuer credit rating compiled by Standard and Poor's and reported in either Thomson One or S&P Capital IQ. Following, Ashbaugh-Skaife et al. (2006) the ratings range from 'AAA' (highest rating) to 'D' (lowest rating) and are collapsed into eight categories as shown in Table 4.1. These ratings reflect the S&P's assessment of the creditworthiness of the obligor with respect to its senior debt obligations. Model 4.1 examines the relation between a fully and partly open DB plan and an overfunded plan with the credit rating. Similarly, Model 4.2 includes interactions of those variables in order to examine their incremental effect. Equations 4.3 and 4.4 examine the effect of the participation of CEOs in the main DB plan along with whether this plan is fully or partially open on credit ratings. Equation 4.4 involves interactions of CEO_MAINDB with FULLY_OPEN and PARTLY_ OPEN to analyse their incremental value. FULLY_OPEN is an indicator variable equal to 1 if the firm has a fully open plan and 0 otherwise. PARTLY_OPEN is an indicator variable equal to 1 if the firm has a partly open plan and 0 otherwise. FUNDED is an indicator variable that equals 1 if the firm has an overfunded plan and 0 otherwise. I predict a positive association between FUNDED and RATING since an overfunded plan is associated with a healthier plan. FULLY_OPEN is an indicator variable that equals 1 if the plan is fully open and 0 otherwise. A fully open plan might be considered a significant financial burden to the firm and therefore might have a negative impact on the firm's credit rating. On the other hand, a 'healthy' open DB plan might not necessarily be considered a problem for the firm and as such, does not negatively affect the firm's debt rating as discussed earlier. As such, I do not make any predictions with regards to the sign of the coefficient on OPEN. PARTLY_OPEN is an indicator variable that equals 1 if the firm has a partially open plan and 0 otherwise. I predict that this variable is similar to OPEN and thus, again, I do not have any a priori expectations with regards to PARTLY_OPEN. CEO_MAINDB is an indicator variable that equals 1 the CEO is a member of the firm's main DB plan and 0 otherwise. Based on the same rationale as above I do not make any predictions about the sign of the coefficient on this variable.

Controls, is a vector of *k* additional factors expected to influence the credit rating. The set of control variables is based on existing literature and includes firm

size, capital intensity, leverage, interest coverage ratio, return on assets, subordinate debt and loss (Ashbaugh-Skaife et al., 2006). The size of the firm (FIRM_SIZE) measured as the natural logarithm of the market value of equity. I predict a positive association between FIRM_SIZE and RATING given that larger firms are expected to have a lower default risk. Capital intensity (CAP_INTENSITY) is measured as the gross PPE divided by total assets and it controls for differences in firms asset structure. Higher capital intensity is associated with lower risk and therefore, I expect a positive association between CAP_INTENSITY and RATING. Ratios such as LEVERAGE (total debt to total equity), interest coverage (ICR) and return on assets (ROA) are used to proxy for firms' default risk. In particular, a higher ROA and ICR and lower LEVERAGE are associated with lower default risk and as a result is associated with a higher debt rating. SUBORD is an indicator variable that equals 1 if the firm has issued subordinate debt and 0 otherwise. This variable is used to control for differences in firms' debt structures. A firm that has issued subordinated debt is considered riskier and I therefore expect a negative association between SUBORD and RATING. LOSS is an indicator variable that equals 1 if the firm has experienced a loss during the current year and 0 otherwise. The probability of default is higher for firms that have negative income. Thus, I posit a negative relation between LOSS and RATING.

Moreover, I control for the FUNDING_RATIO measured as the fair value of plan assets divided by present benefit obligation. I expect a positive association between RATING and FUNDING_RATIO. In addition, in models 4.3 and 4.4 where the role of CEO_MAINDB is examined I also control for the CEO tenure (CEO_TENURE) measured as the number of years that the CEO is in the current position. Continuous variables are winsorized at 1% and 99% to avoid extreme values. All models include industry (INDUSTRY_FE) and year (YEAR_FE) fixed effects to control for cross-sectional differences within industries and time series differences within years. All models use robust standard errors clustered by firm to correct for heteroscedasticity and serial correlation (Rogers, 1993). Variables are defined in Table 4.2, Panel A.

"Inserts Table 4.1 here"

4.3.2 Effects on dividends and capital investments

To estimate the effects that the CEO participation in the main DB plan has on dividend payments and capital investments I use pooled regressions for dividend and investment proxies, respectively. I use the following models:

$$DIVIDENDS_{it} \,/\, INVESTMENTS_{it} = \beta_0 + \beta_1 \, (CEO\_MAINDB_{i,t-1}) + \beta_2 \, (FUNDED_{i,t-1}) \; \beta_k \; (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.5)$$

$$DIVIDENDS_{it} \,/\, INVESTMENTS_{it} = \beta_0 + \beta_1 \, (CEO\_MAINDB_{i,t-1}) + \beta_2 \, (FUNDED_{i,t-1}) + \beta_3 \, (CEO\_MAINDB_{i,t-1} * FUNDED_{i,t-1}) + \beta_k \; (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.6)$$

Also, I examine these effects using changes of the dependent variables.

$$CHG\_DIVIDENDS_{it} \,/\, CHG\_INVESTMENTS_{it} = \beta_0 + \beta_1 \, (CEO\_MAINDB_{i,t-1}) + \beta_2 \, (FUNDED_{i,t-1}) + \beta_k \; (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.7)$$

$$CHG\_DIVIDENDS_{it} \,/\, CHG\_INVESTMENTS_{it} = \beta_0 + \beta_1 \, (CEO\_MAINDB_{i,t-1}) + \beta_2 \, (FUNDED_{i,t-1}) + \beta_3 \, (CEO\_MAINDB_{i,t-1} * FUNDED_{i,t-1}) + \beta_k \; (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.8)$$

I measure DIVIDENDS as follows: dividend payout ratio (PAYOUT) measured as the dividend paid divided by net income; dividend yield (YIELD) measured as the annual dividend per share divided by the stock price per share at the end of the year; Net dividends (NET DIVIDEND) are dividends paid in a given year less the difference between stock issuance and stock repurchase scaled by the book value of total assets. Investments (INVESTMENTS) are measured using capital expenditures divided by net sales. CHG_PAYOUT, CHG_YIELD, CHG_NET_DIVIDEND and CHG_INVESTMENTS are the respective changes in those variables measured as the difference between year *t* and *t-1*.

CEO_MAINDB is an indicator variable that equals 1 if a CEO is a member of the firm's main DB plan and 0 otherwise. As discussed earlier, I do not make any

predictions with regards to the sign of the coefficient on this variable. FUNDED is an indicator variable that equals 1 if the plan is overfunded and 0 otherwise. Prior research indicates that the coefficient on FUNDED is expected to be negative as the more funded a plan is, the less funds available for other activities such as dividend distribution and/or investments. CEO_MAINDB*FUNDED is the interaction of those two variables. I use this interaction in order to examine the incremental effect of these two variables. I do not have any a priori expectations about the sign of the interaction coefficient.

Moreover, I use several control variables based on existing literature (Rauh, 2006; Liu and Tonks, 2013; Eisdorfer et al., 2015). The controls have a few differences between models based on existing literature. I include the funding ratio (FUNDING_RATIO) measured as the fair value of plan assets divided by the projected benefit obligation. I also control for other CEO payment incentives such as salary and bonuses (CEO_SALARY) calculated as CEO's salary and bonuses for the current year scaled by firms' total assets in that year; and CEO equity incentives (CEO_EQUITY) measured as the market value of CEO's common shares plus the value of unexercised stock options. CEO_TENURE is the number of years for which the CEO has been in the current position. Firm size (FIRM_SIZE) measured as the natural logarithm of firms' market value of equity; the book to market value of equity BM; ROA, return on assets measured as net income divided by total assets; CFOP is cash from operations scaled by total assets. LOSS is an indicator equal to 1 if a firm has made a loss and 0 otherwise. LEVERAGE is measured as long-term debt to book value of equity; CAPEX is capital expenditures scaled by total assets; CURRENT_RATIO is measured as current assets divided by current liabilities. Following Rauh (2006), I also control for unobserved investment opportunities (UNOB_INV) calculated as market-to-book ratio of firms' assets. Z_SCORE is Taffler's z-score used to measure firms' bankruptcy risk; BETA is the market beta; FIRM_AGE is years since incorporation; SALARY_CAP is an indicator variable that equals 1 if the firm has imposed a pensionable salary cap and 0 otherwise. DIV_PAYABLE are dividends payable; RETURN is the cumulative return during the last 12 months. All independent variables are lagged by one year to capture conditions that prevail before dividend or investment decisions are made.

Continuous variables are winsorized at 1% and 99% to avoid extreme values. All models include industry- and year- fixed effects to control for cross-sectional differences within industries and time series differences within years. All models use robust standard errors clustered by firm to correct for heteroscedasticity and serial correlation (Rogers, 1993). Variables are defined in Table 4.2, Panel B.

"Insert Table 4.2 here"

4.4 Sample selection and descriptive statistics

4.4.1 Sample selection

The sample for the analysis of the effects on credit ratings includes FTSE All-Share firms which sponsor a DB plan[58] during the period 1999 – 2013 and which have an available long-term issuer credit rating provided by S&P. From the initial sample of 322 companies (3,625 firm year observations), only 101 firms have an available credit rating from S&P. The final sample yielded 945 firm year observations after excluding missing data. The sample for the analysis on the effects on dividends and investments includes all FTSE All-Share firms which sponsor a DB plan (322 firms).

Data on credit ratings are collected from Thomson One and S&P Capital IQ. Data on financial and pension variables are either collected from Worldscope or hand collected from annual reports. Data on executive compensation are obtained from BoardEx. Data sources are shown in Table 4.2, Panels A and B.

[58] As explained in Chapter 1 for a firm to be included in the final sample it has to sponsor a DB plan in 1999 or the first year when the company was established. The sample selection process for these is shown in Table 4.2.

4.4.2 Descriptive statistics

Table 4.3 provides information on the descriptive statistics and correlations for the main and control variables used in the credit ratings analysis[59]. Panel A shows descriptive statistics while Panel B shows pairwise correlations. In particular, Panel A shows that the average long-term S&P credit rating is about 4 which corresponds to a credit rating of 'BBB+' to 'BBB-' range. According to S&P, this rating means that 'on average the obligor has adequate capacity to meet its financial commitments. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitments'. About 54% of firms have an overfunded plan while the mean (median) funding ratio is 93% (91%) suggesting that on average firms in this sample have an underfunded pension plan which makes them financially more vulnerable. Furthermore, 52% of the DB plans in the sample are fully open while about 43% are partially open. Approximately 46% of the CEOs are members of the firms' main DB plan while the average CEO tenure is around 4 years. Average (median) interest coverage ratio and financial leverage are 14.93 (6.68) and 93% (61%) respectively, suggesting that on average the firms in the sample are generating sufficient revenues to satisfy its interest expenses and have relatively low bankruptcy risk. In addition, only 10% of the firms have issued subordinate debt. Panel B presents pairwise correlations between the RATING variable and main and control variables. Panel B shows that the majority of the variables have the expected correlation with the RATING variable. Specifically, RATING is negatively and significantly correlated with FULLY_OPEN (-0.13) and PARTLY_OPEN (-0.07), suggesting that a fully or partially open plan has a negative impact on debt ratings. Moreover, CEO_MAINDB (0.08) and FUNDED (0.02) are positively and significantly correlated with RATING suggesting that an overfunded plan and the participation of the CEO in the firm's main DB plan have a positive correlation with the firms' credit rating. In terms of control variables RATING is positively correlated with SIZE (0.59), ICR (0.09), ROA (0.16) and FUNDING_RATIO (0.15) while it is negatively correlated with LOSS (-0.15) and

[59] All variables have been winsorized at 1 and 99% levels to avoid the effect of outliers.

SUBORD (-0.12). These findings are similar to findings reported in the previous literature (e.g. Ashbaugh-Skaife et al., 2006).

"Insert Table 4.3 here"

Table 4.4 shows descriptive statistics for the main and control variables used to analyse the effect of DB retention and CEO participation on dividends and capital expenditures. Specifically, this Table shows that the average dividend payout ratio is 0.48 while the mean change in this is again negative (approximately -0.03). The negative changes could be explained by the effect of the financial recession. The average dividend yield is 0.03 while the average change in dividend yield is 0; the mean dividend after deducting stock issuance and repurchases is 0.002 while the mean change in this is 0.02. Average changes are very small for dividend measures suggesting that changes in dividends are not preferred from firms due to the market signalling effects of dividends. Average investments are 0.1 while the average change in investments is negative -0.004. Approximately 61% of the CEOs in this sample are members of the firms' main DB plan. The high percentage in this sample is explained by the fact that it includes only firms with fully open DB plans. 34% of the firms have a funded DB plan while the average funding ratio is 98% suggesting that on average these firms have funded pension plans.

"Insert Table 4.4 here"

Table 4.5 shows pairwise correlations between the various dividend measures and investments and the corresponding test and control variables. As it can be seen CEO_MAINDB is positively and significantly correlated to PAYOUT (0.09), YIELD (0.11), and NET_DIVIDENDS (0.11), suggesting that the presence of the CEO in the firm's main DB plan can positively affect the dividend yield and net dividends. FUNDED is negatively and significantly correlated to YIELD (-0.10), CHG_YIELD (-0.09) and NET_DIVIDENDS (-0.04) suggesting that for firms that retain DB plans, a funded plan comes to the expense of investors through payment of less dividends.

"Insert Table 4.5 here"

4.5 Findings

4.5.1 Effects on credit ratings

Table 4.6 presents the findings for the first part of the analysis which refers to the effects DB plan retention and CEO participation in these on credit ratings. Model 4.1 estimates the effects of a DB plan being fully open (FULLY_OPEN) and partly open (PARTLY_OPEN) along with whether the plan is overfunded (FUNDED) on credit ratings. The coefficients on FULLY_OPEN and PARTLY_OPEN are negative and statistically significant (on the 10% and 5% level of significance, respectively), suggesting that a fully or partially open DB plan has an adverse effect on credit rating. The coefficient on FUNDED is not statistically significant.

Model 4.2 extends Model 4.1 by including interactions of FULLY_OPEN and PARTLY_OPEN with FUNDED[60]. While the coefficient on FULLY_OPEN remains negative and statistically significant (on the 5% level), the coefficient on PARTLY_OPEN is not statistically significant. In terms of interactions, the interaction of FUNDED with FULLY_OPEN has a negative and statistically significant coefficient (on the 10% level) while the coefficient on FUNDED*PARTLY_OPEN is not statistically significant. These findings suggest that a fully open plan regardless of funding status has a negative impact on firm's debt rating. However, an underfunded and fully open plan (coefficient on FULLY_OPEN) seems to exacerbate the negative effect as compared to an overfunded and fully open (coefficient on FUNDED * FULLY_OPEN) plan given the higher coefficient. In terms of controls in both models 4.1 and 4.2, FIRM_SIZE, ICR and FUNDING_RATIO have a positive effect on credit rating while SUBORD has a negative effect. These results concur with prior literature and suggest that larger firms with higher interest coverage ratio and higher pension

[60] Ai and Norton (2003) show that the magnitude of the interaction effect in nonlinear models is not equal to the marginal effect of the interaction term, can be of opposite sign, and its statistical significance cannot be calculated by standard non-linear estimation methods. In the present analysis I am interested in the sign rather than the magnitude of the interaction coefficients. Therefore, to address this concern and given that the variables of interest are both indicator variables I have estimated the models 4.2 and 4.4 splitting the sample conditional on FUNDED (for equation 4.3) and by FULLY_OPEN and PARTLY_OPEN (for equation 4.4). Untabulated results confirm that the sign of the coefficients and their statistical significance are consistent to those presented in Table 4.6.

plan funding ratio are considered less likely to default while firms that have issued subordinate debt have higher probability to default.

Models 4.3 and 4.4 estimate the effect CEO_MAINDB has on credit ratings. The results for Model 4.3 show that CEO_MAINDB does not have any statistically significant effect on credit rating. Model 4.4 involves interactions of CEO_MAINDB with FULLY_OPEN and PARTLY_OPEN. The results show that the coefficient on CEO_MAINDB*FULLY_OPEN is positive and statistically significant (on the 5% level), suggesting that a fully open plan that has a CEO who is a member of this plan positively affects credit ratings. As discussed earlier, this might demonstrate the fact that credit rating agencies are aware of the fact that CEOs who are members of firms' main DB plans are more conservative and risk averse. In addition, this could also indicate that the fact that the CEO being a member of this plan signals to debt rating agencies that this plan is sustainable. Therefore, when a plan is fully open but the CEO is not a member of this plan, is perceived as a negative sign resulting in an adverse credit rating for these firms. The negative effect is partially mitigated by the fact that CEO is a member of this plan. In this case, firms are awarded a higher credit rating. Findings for control variables remain the same as in models 4.1 and 4.2 except for FUNDING_RATIO which is no longer statistically significant.

4.5.2 Effects on dividends and investments

Table 4.7 presents the results of panel regressions with fixed industry and year effects for the models based on Equations (4.5) - (4.8) above. Panels A, B, C and D refer to effects on dividend payout ratio, dividend yield, net dividends and investments, respectively. Panel A, Models 4.5 and 4.6, show that CEO_MAINDB has a positive effect on PAYOUT (at the 10% level), suggesting that a CEO being a member of the firm's main DB plan positively affects the dividend payout ratio. This result does not hold in Models 4.7 and 4.8 where the dependent variable is CHG_YIELD. FUNDED and the interaction between CEO_MAINDB and FUNDED is not statistically significant in any model. The latter suggests that there is no evidence to support any incremental effects of CEO_MAINDB and FUNDED. In

terms of control variables, cash from operations (CFOP) in all four models and dividends payable (DIV_PAYABLE) in models 4.5 and 4.6 have a positive effect on the dividend payout ratio and its changes.

The findings in Panel B, where the dependent variables are YIELD (models 4.5 and 4.6) and CHG_YIELD (models 4.7 and 4.8) are similar to those in Panel A. In particular, CEO_MAINDB has a positive and statistically significant coefficient (on the 1% level) in models 4.5 and 4.6. The rest of the variables of interest are not statistically significant. With respect to controls, CEO_SALARY (in models 4.7 and 4.8), CEO_EQUITY (in models 4.7 and 4.8), FIRM_SIZE (in models 4.7 and 4.8), BM (in models 4.5 and 4.6) and CFOP (in models 4.5 and 4.6) are positively associated with YIELD and CHG_YIELD. On the other hand, BM (in models 4.7 and 4.8) and LOSS and UNOB_INV (in models 4.5 and 4.6) have a negative effect on YIELD and CHG_YIELD. These results are in general in line with my expectations and previous literature (e.g. Liu and Tonks, 2013; Eisdorfer et al., 2015)

Panel C shows the results when the dependent variables are NET_DIVIDENDS (Models 4.5 and 4.6) and CHG_NET_DIVIDENDS (Models 4.7 and 4.8). Again, the results with regards to the main variables are similar to those in panels A and B of table 4.7. More specifically, CEO_MAINDB has a positive effect (on the 1% level) on NET_DIVIDENDS. Model 4.5 shows that FUNDED also has a negative and statistically significant (on the 10% level) coefficient. In terms of control variables ROA and CFOP (in models 4.5 and 4.6) have a positive effect on NET_DIVIDENS which is in line with my expectations and previous literature (Liu and Tonks, 2013; Eisdorfer et al., 2015). UNOB_INV and Z_SCORE (in models 4.7 and 4.8) have a positive association with CHG_NET_DIVIDENDS which is not in line with my expectations and previous literature findings. On the contrary, ROA, CFOP and LOSS (in models 4.7 and 4.8) have a negative relation with CHG_NET_DIVIDENDS. While the sign on LOSS is in line with my expectations the signs on ROA and LOSS are not.

Finally, Panel D presents the results when the dependent variables are INVESTMENTS (in models 4.5 and 4.6) and CHG_INVESTMENTS (in models 4.7 and 4.8). The findings in this case are different from what is seen in Panels A, B and

C. In particular, test variables seem to be significant only in Model 4.8. CEO_MAINDB (on the 10% level) and FUNDED (on the 10 % level) are positively associated with CHG_INVESTMENTS while the interaction of those two is negatively associated (on the 5% level) to CHG_INVESTMENTS. In terms of control variables, BM (in models 4.5 and 4.6) has a positive effect on INVESTMENTS while CURRENT_RATIO and BETA (in models 4.5 and 4.6) are negatively related to INVESTMENTS which is in line with my expectations and previous literature (Rauh, 2006; Liu and Tonks, 2013; Eisdorfer et al., 2015).

Overall, these results show some evidence that the participation of CEO in a firm's main DB plan has a positive effect on either dividend payments or changes in dividend payments suggesting that executives are less likely to curtail dividends in order to have more available funds for their DB plans. This finding is in line with the argument that dividends are a corporate policy which provides market signals about the financial health of the firm. Therefore, adjusting dividends might not be a good choice for a firm. Whereas, I find some empirical evidence that adjustments through corporate investments are more likely to happen.

4.6 Additional analysis

4.6.1 Irregular payouts

Given the argument that dividends are not easy to adjust due to being a corporate policy which conveys information to the market about the firm, one might consider that adjustments might take place through other irregular payments such as stock repurchases and special dividends. Therefore, I examine the effect that CEO participation in the firm's main DB plan has along with whether the plan is overfunded has on aggregate irregular payouts. These results are presented in Table 4.8. The dependent variable AGGR_IRREGULAR_PAYOUTS is measured as the sum of stock repurchases and special dividends scaled by total assets and models are in both levels (models 4.5 and 4.6) and changes (models 4.7 and 4.8).

The findings do not support the hypothesis that adjustments can take place through irregular payouts given that none of the test variables is statistically significant.

4.6.2 Other investment measures

In addition to investments in capital expenditures, I also consider investments in research and development (R&D)[61] and the rate of undertaking new investments (RUNI)[62] as developed by Ghicas (1990). The results are shown in Table 4.9 Panels A and B respectively. As it can be seen, neither CEO_MAINDB nor the interaction of CEO_MAINDB*FUNDED seem to have any statistically significant effect on any of those measures. From those models we can only observe the positive effect that an overfunded DB plan has on the decision to undertake R&D investments or the rate of undertaking new investments.

4.6.3 Tobit models

Following Rauh (2006) and Eisendorfer et al. (2015) I use Tobit regressions[63] for the dividend payout ratio, aggregate irregular payouts and R&D investments[64] because it provides a better specification for truncated distributions. The results are presented in Table 4.10. As it can be seen the results are similar with the ones obtained from the panel regressions above.

[61] It should be noted that these results cannot be directly compared to relevant US studies because of different accounting standards related to R&D expense between US GAAP and IFRS.
[62] RUNI is measured as: (Capital Expenditures + Acquisitions + Advertising +R&D)/Total Assets
[63] The Tobit regression, also called a censored regression model, is designed to estimate linear relationships between variables when there is either left- or right-censoring in the dependent variable (also known as censoring from below and above, respectively). Censoring from above takes place when cases with a value at or above some threshold, all take on the value of that threshold, so that the true value might be equal to the threshold, but it might also be higher. In the case of censoring from below, values those that fall at or below some threshold are censored.
[64] R&D is scaled by sales.

4.7 Conclusions

This chapter analyses the effect retention of DB plans, either partially or fully open, has on credit ratings using samples of FTSE All-Share firms during the period 1999-2013. Also, I examine the effect that the participation of CEOs in firms' main DB plan under the same terms as the rest of the employees has on credit ratings, dividend payments and investments. The results show that fully and partly open DB plans have a negative impact on firms' credit ratings. This suggests that credit rating agencies consider open DB plans to increase the default risk for a company. However, CEO participation in main DB schemes assures rating agencies about the riskiness of the plan and the positive effect of this offsets the negative impact of open DB plans. Specifically, this suggests that credit rating agencies do take into consideration the fact that executives that participate in firms' DB plans make more conservative decisions and are more risk averse as such reducing the risk-taking initiatives which would increase the default risk for a firm.

Moreover, the analysis shows that when DB plans remain open, CEO participation in the firm's main DB plan seems to have a positive effect on dividend payments although the evidence is not very strong. In addition, there is also some evidence that CEO membership in the company's DB plan might have a positive effect on investments. However, if these plans are overfunded then the effect on investments is negative, suggesting that to save funds for their pensions, CEOs make adjustments through investments. Overall, these results suggest that when DB plans remain open, dividend policies are less likely to change for the purpose of adjusting pension plan funding. On the contrary, investments seem to be a more common adjustment method used. In other words, it is less likely that CEOs cut dividends to ensure the necessary funds for their DB plans. They will more likely curtail investments for this purpose.

Additional analysis shows that other types of irregular payouts such as share repurchases and special dividends are not affected by the fact that the DB plan remains open and/or the CEO participates in it. Moreover, I do not find empirical evidence that CEO participation in the firms' main DB plan has any effect in other types of investments such as R&D and the rate of undertaking new investments.

Taken together, my results suggest that open DB plans are considered risky resulting in a reduction of firms' credit ratings. The participation of CEOs in those plans alleviates this effect suggesting that credit rating agencies might take this into consideration. In addition, the findings suggest that there is cost from the agency behaviour related to pension funds. More specifically, these costs are related to the fact that the CEOs that are members of the firms' open DB plans might direct funds to less than optimal investments in order to protect their own interests. On the contrary, I do not find such evidence related to dividend policy. These findings suggest that the retention of DB plans and CEOs participation in them play a role in corporate debt rating as well as in the manager- owner agency theory. In particular, they can be a cause for less than optimal corporate decisions.

Appendix III

Table 4.1: Credit rating classifications

S&P Long-Term Issuer Credit Rating	RATING score	Description
AAA	7	An obligor rated 'AAA' has extremely strong capacity to meet its financial commitments. 'AAA' is the highest issuer credit rating assigned by S&P Global Ratings.
AA+	6	An obligor rated 'AA' has very strong capacity to meet its financial commitments. It differs from the highest-rated obligors only to a small degree.
AA	6	
AA-	6	
A+	5	An obligor rated 'A' has strong capacity to meet its financial commitments but is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than obligors in higher-rated categories.
A	5	
A-	5	
BBB+	4	An obligor rated 'BBB' has adequate capacity to meet its financial commitments. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitments.
BBB	4	
BBB-	4	
BB+	3	An obligor rated 'BB' is less vulnerable in the near term than other lower-rated obligors. However, it faces major ongoing uncertainties and exposure to adverse business, financial, or economic conditions which could lead to the obligor's inadequate capacity to meet its financial commitments.
BB	3	
BB-	3	
B+	2	An obligor rated 'B' is more vulnerable than the obligors rated 'BB', but the obligor currently has the capacity to meet its financial commitments. Adverse business, financial, or economic conditions will likely impair the obligor's capacity or willingness to meet its financial commitments.
B	2	
B-	2	
CCC	1	An obligor rated 'CCC' is currently vulnerable, and is dependent upon favourable business, financial, and economic conditions to meet its financial commitments.
CC	1	An obligor rated 'CC' is currently highly vulnerable. The 'CC' rating is used when a default has not yet occurred, but S&P Global Ratings expects default to be a virtual certainty, regardless of the anticipated time to default.

R	1	An obligor rated 'R' is under regulatory supervision owing to its financial condition. During the pendency of the regulatory supervision the regulators may have the power to favor one class of obligations over others or pay some obligations and not others.
SD and D	1	An obligor rated 'SD' (selective default) or 'D' is in default on one or more of its financial obligations including rated and unrated financial obligations but excluding hybrid instruments classified as regulatory capital or in non-payment according to terms. An obligor is considered in default unless S&P Global Ratings believes that such payments will be made within five business days of the due date in the absence of a stated grace period, or within the earlier of the stated grace period or 30 calendar days. A 'D' rating is assigned when S&P Global Ratings believes that the default will be a general default and that the obligor will fail to pay all or substantially all of its obligations as they come due. An 'SD' rating is assigned when S&P Global Ratings believes that the obligor has selectively defaulted on a specific issue or class of obligations but it will continue to meet its payment obligations on other issues or classes of obligations in a timely manner. An obligor's rating is lowered to 'D' or 'SD' if it is conducting a distressed exchange offer.
NR	0	An issuer designated 'NR' is not rated. This indicates that no rating has been requested, or that there is insufficient information on which to base a rating.

Notes: Firm credit rating are the long-term issuer credit ratings compiled by Standard and Poor's and reported on Thomson One and Capital IQ. The ratings range from AAA (highest rating) to D (lowest rating) and NR (when no rating is issued). These ratings reflect the assessment of the creditworthiness of the obligor with respect to its senior debt obligations. For the purposes of the present analysis ratings are collapsed into eight categories as provided in the Table above.

The rating 'CCC' may also be modified by the addition of a plus (+) or minus (-) sign to show relative standing within the major rating categories.

Source: S & P Global Ratings (https://www.standardandpoors.com/en_US/web/guest/article/-/view/sourceId/504352)

Table 4.2: Variable definitions and sources

PANEL A: CREDIT RATINGS ANALYSIS		
Variable	**Description**	**Source**
RATING	S&P long term issuer credit rating collapsed in eight categories as shown in Table 4.1.	Thomson One and S&P Capital IQ.
FUNDED	Indicator variable that equals 1 if the plan is overfunded and 0 otherwise.	
FULLY_OPEN	Indicator variable that equals 1 if the plan is fully open and 0 otherwise.	Hand-collected from Annual Reports
PARTLY_OPEN	Indicator variable that equals 1 if the plan is partially open and 0 otherwise.	Hand-collected from Annual Reports
CEO_MAINDB	Indicator variable that equals 1 if the CEO is member of the firms' main DB plan and 0 otherwise.	Hand-collected from Annual Reports
FIRM_SIZE	The firm size measured as the natural logarithm of the market value of equity.	Worldscope
CAP_INTENSITY	Capital intensity is measured as the gross PPE divided by total assets and it controls for differences in firms asset structure.	Worldscope
LEVERAGE	Measured as total debt to total equity.	Worldscope
ICR	Interest coverage ratio measured as operating income divided by interest expense.	Worldscope
ROA	Return on Assets measured as Net Income divided by Total Assets	Worldscope
SUBORD	Indicator variable equal to1 if the firm has issued subordinated debt.	S&P Capital IQ
LOSS	Loss is an indicator variable that equals 1 if the firm has experienced a loss during the current year and 0 otherwise	
FUNDING RATIO	Funding ratio is measured as the fair value of plan assets divided by present benefit obligation.	Worldscope
CEO_TENURE	CEO tenure measured as the number of years that the CEO is in the current position.	Hand-collected from Annual Reports

PANEL B: DIVIDEND AND INVESTMENT ANALYSIS

Variable	Description	Source
PAYOUT	Dividend payout is measured as the dividend paid during a year divided by the net income during that year	Worldscope
CHG_PAYOUT	The change in dividend pay-out calculated as PAYOUTt – PAYOUTt-1	
YIELD	Dividend yield is measured as the annual dividend per share divided by the stock price per share at the end of the years	Worldscope
CHG_YIELD	The change in dividend pay-out calculated as YIELDt – YIELDt-1	
NET DIVIDENDS	Net dividends are measure as dividends paid in a given year less the difference between stock issuance and stock repurchase during that year scaled by the book value of total assets	Worldscope
CHG_NET_DIVIDENDS	The change in net dividends calculated as NET_DIVIDENDSt – NET_DIVIDENDSt-1	
INVESTMENTS	Investments are measured using capital expenditures during a given year divided by net sales during that year	Worldscope
CHG_INVESTMENTS	The change in INVESTMENTS calculated as INVESTMENTSt – INVESTMENTSt-1	
CEO_MAINDB	An indicator variable that equals 1 if the plan is overfunded and 0 otherwise	Hand-collected from Annual Reports
FUNDED	FUNDED is an indicator variable that equals 1 if the plan is overfunded and 0 otherwise	Worldscope and hand-collected from Annual Reports
FUNDING_RATIO	Funding ratio is measured as the fair value of plan assets divided by present benefit obligation	Worldscope and hand-collected from Annual Reports
CEO_SALARY	Measured as salary and bonuses scaled by total assets	BoardEx
CEO_EQUITY	CEO equity incentives is measured as the market value of CEO's common equity plus the value of unexercised stock options scaled by the firm's total assets	BoardEx
CEO_TENURE	CEO_TENURE is the number of years for which the CEO has been in the current position	Hand - collected

FIRM_SIZE	The firm size (FIRM_SIZE) measured as the natural logarithm of firms' market value of equity	Worldscope
BM	The book to market value of equity BM	Worldscope
ROA	Return on assets measured as net income divided by total assets	Worldscope
CFO	CFO is cash from operations scaled by total assets.	Worldscope
LOSS	Loss is an indicator variable that equals 1 if a firm has made a loss and 0 otherwise	
LEVERAGE	Leverage is measured as long-term debt divided by the book value of equity	Worldscope
CAPEX	Capital expenditures scaled by total assets	Worldscope
CURRENT_RATIO	Current ratio is measured as current assets divided by current liabilities	Worldscope
UNOB_INV	Unobserved investment opportunities measured as the market- to- book ratio of firms' assets following Rauh (2006) Calculated as: (Market Capitalization + Assets -Common Equity - Deferred Tax)/ Assets	Worldscope
Z_SCORE	Z_SCORE is the Altman z-score used to measure the firms bankruptcy risk	Worldscope
BETA	BETA is the market beta	The London Share Price Database (LSPD)
FIRM_AGE	Firm age is the age of the firm in years	The London Share Price Database (LSPD)
SALARY_CAP	An indicator variable that equals 1 if the firm has imposed a pensionable salary cap and 0 otherwise	Hand – collected from Annual Reports
DIV_PAYABLE	Dividends payable	Worldscope
RETURN	The cumulative return during the last 12 months	The London Share Price Database (LSPD)

Table 4.3: Credit ratings analysis - Descriptive statistics and correlations

Panel A: Descriptive statistics (N=945)

	Average	Std. Dev.	Min	P25	Median	P75	Max
RATING	4.011	1.535	0.000	4.000	4.000	5.000	7.000
FULLY_OPEN	0.524	0.500	0.000	0.000	1.000	1.000	1.000
PARTLY_OPEN	0.425	0.495	0.000	0.000	0.000	1.000	1.000
FUNDED	0.543	0.498	0.000	0.000	1.000	1.000	1.000
CEO_MAINDB	0.456	0.498	0.000	0.000	0.000	1.000	1.000
CEO_TENURE	3.968	3.815	0.000	1.000	3.000	5.000	27.000
FIRM_SIZE	8.504	1.442	2.996	7.616	8.429	9.499	11.215
CAP_INTENSITY	0.577	0.408	0.003	0.228	0.552	0.880	1.570
ICR	14.927	49.146	-8.807	3.969	6.678	11.403	847.852
ROA	0.047	0.077	-0.320	0.011	0.044	0.081	0.263
LOSS	0.087	0.282	0.000	0.000	0.000	0.000	1.000
LEVERAGE	0.930	2.412	-7.243	0.265	0.605	1.216	12.289
SUBORD	0.102	0.302	0.000	0.000	0.000	0.000	1.000
FUNDING_RATIO	0.926	0.159	0.528	0.825	0.911	1.010	1.450

Panel B: Correlation analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
RATING (1)	1.00													
FULLY_OPEN (2)	-0.13***	1.00												
PARTLY_OPEN (3)	-0.07**	-0.84***	1.00											
FUNDED (4)	0.02	0.23***	-0.22***	1.00										
CEO_MAINDB (5)	0.08***	0.28***	-0.129***	0.04**	1.00									
CEO_TENURE (6)	-0.05	0.01	-0.04**	-0.04**	0.07***	1.00								
FIRM_SIZE (7)	0.59***	-0.02	0.09***	0.05***	-0.01	-0.06***	1.00							
CAP_INTENSITY (8)	0.01	0.1***	-0.06***	-0.01	0.01	0.01	-0.02	1.00						
ICR (9)	0.09***	-0.08***	0.08***	-0.05***	0.01	0.18***	-0.08***	-0.02	1.00					
ROA (10)	0.16***	-0.05***	0.07***	0.05***	0.03*	0.12***	0.22***	0.04**	0.19***	1.00				
LOSS (11)	-0.15***	0.00***	-0.03*	-0.01	-0.04**	-0.1***	-0.18***	-0.02	-0.08***	-0.58***	1.00			
LEVERAGE (12)	0.04	-0.03*	0.06***	-0.05***	-0.02	0.00	0.07***	-0.01	-0.09***	-0.07***	-0.02	1.00		
SUBORD (13)	-0.12***	-0.04***	0.07***	0.04**	0.04**	-0.02	0.11***	-0.15***	-0.05**	-0.09***	0.04**	0.16***	1.00	
FUNDING_RATIO (14)	0.15***	0.31***	-0.28***	0.78***	0.08***	-0.06***	0.06***	0.03*	-0.06***	0.06***	-0.03*	-0.06***	0.01	1.00

Notes: Table 4.3 presents the descriptive statistics (Panel A) and Pearson correlation coefficients for the sample used for the credit ratings analysis (Panel B). ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed). Continuous variables are winsorized at 1% and 99% to avoid the effect of outliers. All variables are defined in Table 4.2, Panel A.

Table 4.4: Dividends and investments analysis - Descriptive statistics

Panel A: Descriptive statistics

	N	Average	Std. Dev.	Min	P25	Median	P75	Max
PAYOUT	1837	0.480	0.590	-0.886	0.229	0.426	0.649	2.421
CHG_PAYOUT	1515	-0.025	1.058	-6.286	-0.120	0.000	0.144	5.521
YIELD	1803	0.034	0.021	0.000	0.021	0.031	0.045	0.102
CHG_YIELD	1482	0.000	0.017	-0.102	-0.005	0.000	0.006	0.087
NET_DIVIDENDS	1841	0.022	0.066	-0.303	0.010	0.021	0.036	0.322
CHG_NET_DIVIDENDS	1518	0.002	0.076	-0.624	-0.006	0.000	0.008	0.528
INVESTMENTS	1838	0.103	0.221	0.000	0.024	0.043	0.079	1.607
CHG_INVESTMENTS	1515	-0.004	0.140	-1.489	-0.011	-0.001	0.007	1.524
CEO_MAINDB	1511	0.607	0.489	0.000	0.000	1.000	1.000	1.000
FUNDED	1521	0.346	0.476	0.000	0.000	0.000	1.000	1.000
FUNDING_RATIO	1510	0.980	0.191	0.528	0.846	0.975	1.110	1.450
CEO_SALARY	1374	0.001	0.001	0.000	0.000	0.000	0.001	0.007
CEO_EQUITY	1371	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CEO_TENURE	1519	5.178	5.363	0.000	1.000	4.000	7.000	33.00
FIRM_SIZE	1521	6.813	1.691	2.996	5.565	6.724	7.943	11.22
BM	1515	0.620	0.589	-0.301	0.266	0.462	0.802	3.458
ROA	1518	0.042	0.080	-0.320	0.019	0.048	0.081	0.263
CFOP	1520	0.081	0.068	-0.153	0.042	0.081	0.118	0.285
LOSS	1521	0.095	0.294	0.000	0.000	0.000	0.000	1.000
LEVERAGE	1516	0.635	1.823	-7.243	0.107	0.428	0.796	12.29
DIV_PAYABLE	1517	98.40	244.7	0.000	5.573	19.182	70.80	1837
CAPEX	1520	0.055	0.044	0.000	0.025	0.044	0.072	0.218
UNOB_INV	1514	2.431	1.193	1.080	1.784	2.138	2.659	8.405
CURRENT_RATIO	1493	1.398	0.832	0.344	0.868	1.220	1.639	5.317
Z_SCORE	1520	3.634	10.104	-30.053	0.367	3.263	7.061	32.092
BETA	1520	0.930	0.270	0.240	0.760	0.950	1.110	1.600
RETURN	1811	0.041	0.396	-1.389	-0.166	0.076	0.281	1.029
FIRM_AGE	1843	52.17	61.21	1.000	10.00	20.00	79.00	262.0
SALARY_CAP	1510	0.053	0.224	0.000	0.000	0.000	0.000	1.000

Notes: Table 4.4 presents the descriptive statistics for the sample used for the dividends and investments analysis. Continuous variables are winsorized at 1% and 99% to avoid the effect of outliers. All variables are defined in Table 4.2, Panel B.

Table 4.5: Dividends and investments analysis - Pairwise correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
INVESTMENTS (1)	1.00														
CHG_INVESTMENTS (2)	0.31***	1.00													
PAYOUT (3)	0.01	0.02	1												
CHG_PAYOUT (4)	0.01	0.01	0.47***	1.00											
YIELD (5)	-0.02	0.04	0.26***	0.01	1										
CHG_YIELD (6)	0.01	0.04	0.09***	0.08**	0.38***	1.00									
NET_DIVIDENDS (7)	-0.05**	-0.00	0.11***	0.00	0.23***	0.03	1								
CHG_NET_DIVIDENDS (8)	0.01	-0.01	-0.02	-0.01	-0.00	0.06**	0.56***	1.00							
CEO_MAINDB (9)	0.01	0.01	0.09***	-0.01	0.11***	0.04	0.11***	-0.02	1.00						
FUNDED (10)	-0.02	0.03	0.03	-0.00	-0.10***	-0.09***	-0.04*	0.02	-0.03	1.00					
FUNDING_RATIO (11)	0.02	-0.01	0.01	-0.00	0.11***	0.06	0.03	-0.04	0.06	-0.77***	1.00				
CEO_SALARY (12)	-0.03	-0.02	-0.09***	0.02	-0.16***	0.01	-0.06**	-0.01	-0.05*	0.01	-0.02	1.00			
CEO_EQUITY (13)	-0.00	-0.00	0.01	-0.01	0.01	0.05*	-0.04*	0.00	-0.00	-0.04*	0.05*	0.09***	1.00		
CEO_TENURE (14)	0.03	-0.02	0.02	0.00	0.01	0.02	0.04	0.00	0.10**	0.07**	-0.09***	0.10***	0.03	1.00	
FIRM_SIZE (15)	0.02	0.04*	0.14***	0.00	0.04*	0.11***	0.15***	0.01	0.09***	0.03	-0.02	-0.52***	-0.04*	-0.07**	1.00
BM (16)	0.14***	-0.02***	-0.08	-0.02***	0.14	-0.18***	-0.04***	0.00	-0.07**	-0.05*	0.06**	-0.12***	-0.02	-0.04	-0.28***
ROA (17)	-0.05**	0.05*	0.11***	-0.03	0.13***	0.10***	0.25***	-0.06**	0.09***	-0.10***	0.09***	0.08**	0.04	0.11***	0.20***
CFOP (18)	-0.07**	0.04	0.11***	0.02	0.18***	0.04	0.22***	-0.07**	0.05	0.03	0.00	0.05*	0.00	0.14***	0.15***
LOSS (19)	0.03	-0.06	-0.17***	0.10***	-0.24***	-0.08**	-0.16***	0.01	-0.07**	0.01	-0.03	0.12***	-0.01	-0.09***	-0.18***
LEVERAGE (20)	0.02	-0.00	-0.02	-0.01	0.04	0.01	0.01	0.02	0.00	0.03	-0.06**	-0.10***	-0.04	0.01	0.07**
DIV_PAYABLE (21)	0.03	0.02	0.13***	-0.01	0.09***	0.04	0.13***	0.00	0.13***	0.07**	-0.02	-0.23***	-0.01	-0.04	0.60***
CAPEX (22)	0.24***	-0.17***	0.05*	-0.01	0.07**	0.01	0.04	-0.04	-0.05*	0.09***	0.11***	-0.03	0.15***	-0.02	-0.06**
UNOB_INV (23)	0.02	0.02	-0.01	0.03	-0.25***	0.09***	0.05**	0.02	0.02	-0.08**	0.06**	0.37***	0.02	0.08**	0.14***
CURRENT_RATIO (24)	-0.01	-0.03	-0.13***	-0.02	-0.10***	-0.01	-0.02	0.05*	-0.00	-0.06**	0.02	0.29	0.02	0.03	-0.26***
Z_SCORE (25)	-0.08**	0.05*	-0.00	0.03	-0.11***	0.06**	0.10***	0.02	0.05*	-0.12***	0.11***	0.32***	0.03	0.13***	0.08**
BETA (26)	-0.17***	-0.01	-0.09***	0.01	-0.13***	-0.02	-0.07**	-0.02	-0.13***	-0.01	-0.02	-0.00	-0.02	-0.06**	-0.06**
RETURN (27)	-0.02	-0.01	0.02	0.01	-0.13	0.01	0.00	0.00	0.02	0.04	-0.02	0.07**	0.02	0.01	0.13***
FIRM_AGE (28)	-0.08***	0.01	0.03	0.00	0.06**	-0.02	0.09***	-0.01	-0.04*	-0.03	0.06**	-0.11***	0.03	-0.06**	0.05*
SALARY_CAP (29)	-0.04*	0.01	0.03	0.02	0.02	0.01	0.01	-0.00	0.01	0.10***	-0.10***	-0.03	-0.04	-0.02	0.11***

Table 4.5: Dividends and investments analysis - Pairwise correlations (continued)

	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)
BM (16)	1.00													
ROA (17)	-0.25***	1.00												
CFOP (18)	-0.25***	0.44***	1.00											
LOSS (19)	0.21***	-0.62***	-0.32***	1.00										
LEVERAGE (20)	-0.01	-0.05*	-0.02	-0.02	1.00									
DIV_PAYABLE (21)	-0.07**	0.05**	0.04*	-0.05**	0.05*	1.00								
CAPEX (22)	0.12***	0.40***	-0.07**	-0.05**	0.04	0.03	1.00							
UNOB_INV (23)	-0.36***	0.29***	0.18***	-0.02	-0.12***	0.00	0.18***	1.00						
CURRENT_RATIO (24)	0.10***	0.01	-0.23***	0.17***	-0.02	-0.18***	-0.22***	0.10***	1.00					
BETA (26)	0.05**	-0.17***	-0.14***	0.14***	-0.02	-0.09***	-0.22***	-0.08**	0.15***	-0.09***	1.00			
RETURN (27)	-0.34***	0.23***	0.12***	-0.25***	-0.02	-0.01	-0.03	0.23***	0.03	0.22***	-0.07**	1.00		
FIRM_AGE (28)	0.05*	0.03	-0.03	-0.04	-0.03	0.03	-0.10***	-0.07**	0.01	-0.01	0.16***	-0.01	1.00	
SALARY_CAP (29)	-0.02	0.04	-0.02	-0.04*	0.04	0.07**	-0.05**	-0.05**	-0.07**	-0.03	0.06**	-0.01	0.06**	1.00

Notes: Table 4.5 reports the Pearson correlation coefficients for the sample used for the dividends and investment analyses. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed). All variables are defined in Table 4.1.

Table 4.6: Effects on credit ratings

Dependent Variable: Credit rating (RATING)				
	(4.1)	(4.2)	(4.3)	(4.4)
FULLY_OPEN	-1.127*	-1.307**	-1.167*	-1.435**
	(-1.85)	(-2.02)	(-1.85)	(-2.18)
PARTLY_OPEN	-0.467**	-0.325	-0.518**	-0.465*
	(-2.00)	(-1.35)	(-2.16)	(-1.95)
FUNDED	0.069	0.423	0.076	0.060
	(0.59)	(1.52)	(0.63)	(0.49)
FUNDED*FULLY_OPEN		-0.641*		
		(-1.88)		
FUNDED*PARTLY_OPEN		-0.228		
		(-0.69)		
CEO_MAINDB			0.235	-0.580
			(1.43)	(-1.28)
CEO_TENURE			-0.0166	-0.0187
			(-1.05)	(-1.17)
CEO_MAINDB*FULLY_OPEN				1.069**
				(2.41)
CEO_MAINDB*PARTLY_OPEN				0.471
				(0.92)
FIRM_SIZE	0.794***	0.790***	0.795***	0.803***
	(11.19)	(11.17)	(11.30)	(11.61)
CAP_INTENSITY	0.202	0.194	0.196	0.181
	(0.93)	(0.89)	(0.90)	(0.85)
ICR	0.004***	0.004***	0.004***	0.004***
	(3.92)	(3.80)	(3.84)	(3.45)
ROA	-0.240	-0.166	-0.239	-0.356
	(-0.36)	(-0.25)	(-0.35)	(-0.52)
LOSS	-0.088	-0.075	-0.089	-0.083
	(-0.54)	(-0.46)	(-0.53)	(-0.50)
LEVERAGE	0.021	0.022	0.022	0.019
	(0.95)	(1.03)	(1.02)	(0.86)
SUBORD	-0.869***	-0.863***	-0.893***	-0.975***
	(-2.71)	(-2.72)	(-2.72)	(-3.00)
FUNDING_RATIO	1.225*	1.803**	1.143	1.197
	(1.71)	(2.25)	(1.49)	(1.49)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
SE Clustered by firm	Yes	Yes	Yes	Yes
N	945	945	945	945
Pseudo R^2	0.314	0.316	0.317	0.321

Notes: Table 4.6 presents the ordered probit regression results for the analysis of the effects of DB plan retentions and CEO participation in them on the credit ratings. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed). t- statistics are shown in parentheses. All variables are defined in Table 4.1. The estimated models are shown below:

$$RATING_{it} = \beta_0 + \beta_1 (FUNDED_{it}) + \beta_2 (FULLY\_OPEN_{it}) + \beta_3 (PARTIALLY\_OPEN_{it}) + \beta_k (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.1)$$

$$RATING_{it} = \beta_0 + \beta_1 (FUNDED_{it}) + \beta_2 (FULLY\_OPEN_{it}) + \beta_3 (PARTIALLY\_OPEN_{it}) + \beta_4 (FUNDED_{it} * FULLY\_OPEN_{it}) + \beta_5 (FUNDED_{it} * PARTIALLY\_OPEN_{it}) + \beta_k (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.2)$$

$$RATING_{it} = \beta_0 + \beta_1 (FUNDED_{it}) + \beta_2 (FULLY\_OPEN_{it}) + \beta_3 (PARTIALLY\_OPEN_{it}) + \beta_4 (CEO\_MAINDB_{it}) + \beta_k (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.3)$$

$$RATING_{it} = \beta_0 + \beta_1 (FUNDED_{it}) + \beta_2 (FULLY\_OPEN_{it}) + \beta_3 (PARTIALLY\_OPEN_{it}) + \beta_4 (CEO\_MAINDB_{it}) + \beta_5 (CEO\_MAINDB_{it} * FULLY\_OPEN_{it}) + \beta_6 (CEO\_MAINDB_{it} * PARTIALLY\_OPEN_{it}) + \beta_k (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.4)$$

Table 4.7: Effects on dividends and investments

Panel A : Effect on dividends (PAYOUT)

	Dependent variable: Dividend payout ratio		Dependent variable: Change in dividend payout ratio	
	(4.5)	(4.6)	(4.7)	(4.8)
CEO_MAINDB	0.072*	0.084*	-0.034	-0.061
	(1.84)	(1.79)	(-0.82)	(-1.04)
FUNDED	0.042	0.059	-0.036	-0.076
	(0.77)	(0.86)	(-0.42)	(-0.77)
CEO_MAINDB*FUNDED		-0.033		0.0726
		(-0.45)		(0.65)
FUNDING_RATIO	0.172	0.169	-0.247	-0.242
	(1.00)	(0.98)	(-1.04)	(-1.02)
CEO_SALARY	-4.165	-4.523	-3.804	-3.004
	(-0.18)	(-0.20)	(-0.16)	(-0.13)
CEO_EQUITY‡	0.517	0.525	-0.761	-0.779
	(0.67)	(0.68)	(-0.53)	(-0.54)
CEO_TENURE	0.001	0.001	0.001	0.001
	(0.37)	(0.37)	(0.25)	(0.25)
FIRM_SIZE	0.026	0.026	0.016	0.016
	(1.45)	(1.44)	(0.79)	(0.79)
BM	-0.019	-0.018	-0.038	-0.040
	(-0.51)	(-0.49)	(-0.84)	(-0.87)
ROA	-0.097	-0.099	0.295	0.300
	(-0.33)	(-0.33)	(0.41)	(0.42)
CFOP	0.507	0.510	1.129**	1.122**
	(1.60)	(1.61)	(2.37)	(2.35)
LOSS	-0.215**	-0.217**	0.635***	0.639***
	(-2.28)	(-2.30)	(3.41)	(3.41)
LEVERAGE	-0.013*	-0.013*	-0.006	-0.005
	(-1.71)	(-1.74)	(-0.54)	(-0.51)
DIV_PAYABLE	0.000*	0.000*	-0.000	-0.000
	(1.75)	(1.77)	(-0.10)	(-0.13)
CAPEX	0.336	0.347	-0.545	-0.570
	(0.74)	(0.76)	(-0.79)	(-0.83)
UNOB_INV	-0.009	-0.009	0.028	0.028
	(-0.44)	(-0.43)	(0.84)	(0.81)
BETA	-0.137*	-0.138*	-0.0370	-0.0338
	(-1.92)	(-1.92)	(-0.47)	(-0.43)
RETURN	-0.006	-0.006	0.107	0.107
	(-0.11)	(-0.11)	(0.94)	(0.93)
SALARY_CAP	0.050	0.053	0.060	0.055
	(0.65)	(0.69)	(1.00)	(0.91)
INTERCEPT	0.675**	0.380	-0.263	0.074
	(2.33)	(1.57)	(-0.72)	(0.21)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
SE Clustered by firm	Yes	Yes	Yes	Yes
N	1357	1357	1357	1357
adj. R^2	0.052	0.051	0.003	0.002

Panel B : Effect on dividends (YIELD)

	Dependent variable: Dividend yield		Dependent variable: Change in dividend yield	
	(4.5)	(4.6)	(4.7)	(4.8)
CEO_MAINDB	0.005***	0.005***	0.001	0.001
	(3.07)	(2.73)	(0.14)	(0.62)
FUNDED	-0.002	-0.002	-0.002	-0.001
	(-1.18)	(-0.95)	(-1.38)	(-0.72)
CEO_MAINDB*FUNDED		-0.000		-0.001
		(-0.13)		(-0.74)
FUNDING_RATIO	-0.003	-0.003	-0.002	-0.002
	(-0.48)	(-0.48)	(-0.46)	(-0.49)
CEO_SALARY	0.885	0.882	0.958	0.946**
	(0.81)	(0.81)	(2.11)	(2.06)
CEO_EQUITY‡	0.006	0.006	0.036*	0.037*
	(0.20)	(0.21)	(1.72)	(1.73)
CEO_TENURE	0.000	0.000	0.000	0.000
	(0.03)	(0.03)	(1.08)	(1.06)
FIRM_SIZE	0.001	0.001	0.001***	0.001***
	(1.27)	(1.28)	(4.53)	(4.52)
BM	0.005**	0.005**	-0.005***	-0.004***
	(1.99)	(1.99)	(-2.92)	(-2.87)
ROA	0.006	0.006	0.005	0.005
	(0.43)	(0.43)	(0.50)	(0.49)
CFOP	0.049***	0.049***	-0.006	-0.006
	(3.42)	(3.42)	(-0.70)	(-0.69)
LOSS	-0.013***	-0.013***	-0.002	-0.002
	(-3.81)	(-3.82)	(-0.57)	(-0.60)
LEVERAGE	0.000	0.000	0.000	0.000
	(0.25)	(0.24)	(0.68)	(0.67)
CAPEX	0.014	0.014	-0.003	-0.003
	(0.76)	(0.76)	(-0.29)	(-0.25)
UNOB_INV	-0.004***	-0.004***	-0.000	-0.000
	(-3.76)	(-3.76)	(-0.45)	(-0.41)
Z_SCORE	-0.000	-0.000	0.000**	0.000**
	(-0.09)	(-0.09)	(2.10)	(2.12)
RETURN	-0.002	-0.002	-0.003	-0.003
	(-0.95)	(-0.95)	(-1.43)	(-1.42)
FIRM_AGE	-0.000	-0.000	0.000	0.000
	(-0.22)	(-0.23)	(0.70)	(0.66)
SALARY_CAP	0.001	0.001	-0.000	-0.000
	(0.30)	(0.31)	(-0.30)	(-0.21)
INTERCEPT	0.012	0.025***	-0.006	-0.012**
	(1.11)	(3.00)	(-0.98)	(-2.18)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
SE Clustered by firm	Yes	Yes	Yes	Yes
N	1346	1346	1342	1342
adj. R^2	0.225	0.224	0.076	0.075

Panel C : Effect on dividends (NET DIVIDENDS)

	Dependent variable: Net dividends		Dependent variable: Change in net dividends	
	(4.5)	(4.6)	(4.7)	(4.8)
CEO_MAINDB	0.011***	0.014***	-0.004	-0.001
	(3.13)	(3.29)	(-1.35)	(-0.16)
FUNDED	-0.009*	-0.004	-0.001	0.003
	(-1.68)	(-0.72)	(-0.21)	(0.41)
CEO_MAINDB*FUNDED		-0.010		-0.010
		(-1.36)		(-1.12)
FUNDING_RATIO	0.001	-0.000	-0.008	-0.009
	(0.03)	(-0.01)	(-0.64)	(-0.69)
CEO_SALARY	-3.313	-3.404	-1.251	-1.342
	(-0.72)	(-0.74)	(-0.38)	(-0.40)
CEO_EQUITY‡	-0.144	-0.140	0.035	0.037
	(-1.44)	(-1.40)	(0.27)	(0.29)
CEO_TENURE	0.000	0.000	-0.000	-0.000
	(0.13)	(0.12)	(-0.26)	(-0.26)
FIRM_SIZE	0.003	0.003	0.001	0.001
	(1.48)	(1.49)	(0.58)	(0.60)
BM	0.004	0.004	-0.001	-0.001
	(1.03)	(1.07)	(-0.18)	(-0.14)
ROA	0.143**	0.143**	-0.128**	-0.128**
	(2.32)	(2.32)	(-2.23)	(-2.23)
CFOP	0.164***	0.164***	-0.079*	-0.079*
	(3.49)	(3.50)	(-1.88)	(-1.86)
LOSS	-0.003	-0.003	-0.021**	-0.022**
	(-0.29)	(-0.35)	(-2.23)	(-2.32)
LEVERAGE	-0.000	-0.000	0.000	0.000
	(-0.09)	(-0.13)	(0.34)	(0.31)
CAPEX	-0.035	-0.031	-0.001	0.002
	(-0.68)	(-0.60)	(-0.03)	(0.05)
UNOB_INV	0.003	0.003	0.006***	0.006***
	(0.60)	(0.62)	(2.69)	(2.71)
Z_SCORE	0.000	0.000	0.001***	0.001***
	(0.27)	(0.27)	(3.27)	(3.28)
RETURN	-0.016**	-0.015**	-0.007	-0.007
	(-2.28)	(-2.27)	(-1.02)	(-1.01)
FIRM_AGE	0.000	0.000	-0.000	-0.000
	(0.53)	(0.48)	(-1.15)	(-1.22)
SALARY_CAP	-0.004	-0.004	-0.004	-0.003
	(-0.71)	(-0.62)	(-0.77)	(-0.66)
INTERCEPT	0.021	-0.019	0.024	-0.000
	(0.59)	(-0.67)	(0.80)	(-0.00)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
SE Clustered by firm	Yes	Yes	Yes	Yes
N	1356	1356	1355	1355
adj. R^2	0.118	0.119	0.013	0.013

Panel D: Effect on investments

	Dependent variable: Investments		Dependent variable: Change in Investments	
	(4.5)	(4.6)	(4.7)	(4.8)
CEO_MAINDB	-0.015	-0.015	0.003	0.013*
	(-0.84)	(-0.74)	(0.58)	(1.94)
FUNDED	0.028	0.029	0.013	0.028*
	(1.04)	(0.89)	(1.13)	(1.94)
CEO_MAINDB*FUNDED		-0.002		-0.027**
		(-0.06)		(-2.10)
FUNDING_RATIO	0.002	0.002	0.009	0.008
	(0.04)	(0.04)	(0.39)	(0.32)
CEO_SALARY	-4.726	-4.739	-1.544	-1.780
	(-0.43)	(-0.43)	(-0.47)	(-0.52)
CEO_EQUITY‡	0.159	0.186	-0.024	-0.017
	(0.56)	(0.57)	(-0.34)	(-0.24)
CEO_TENURE	0.001	0.001	-0.001	-0.001
	(0.60)	(0.60)	(-1.45)	(-1.43)
PAYOUT	-0.002	-0.002	-0.000	-0.000
	(-0.69)	(-0.70)	(-0.18)	(-0.29)
FIRM_SIZE	0.010	0.010	0.001	0.001
	(1.13)	(1.13)	(0.21)	(0.24)
BM	0.078***	0.078***	0.003	0.004
	(3.52)	(3.51)	(0.30)	(0.35)
ROA	-0.052	-0.052	-0.033	-0.035
	(-0.30)	(-0.30)	(-0.27)	(-0.30)
CFOP	0.038	0.038	-0.067	-0.061
	(0.27)	(0.28)	(-0.91)	(-0.82)
LOSS	0.019	0.019	-0.001	-0.003
	(0.67)	(0.66)	(-0.05)	(-0.13)
LEVERAGE	0.003	0.003	-0.001	-0.001
	(0.60)	(0.60)	(-1.49)	(-1.62)
UNOB_INV	0.017	0.017	0.003	0.003
	(1.20)	(1.20)	(0.52)	(0.55)
CURRENT_RATIO	-0.036**	-0.036**	-0.008	-0.007
	(-2.01)	(-2.03)	(-0.67)	(-0.63)
Z_SCORE	0.002	0.002	0.002	0.002
	(0.85)	(0.86)	(1.44)	(1.42)
BETA	-0.149***	-0.149***	-0.011	-0.012
	(-3.70)	(-3.73)	(-0.97)	(-1.10)
FIRM_AGE	-0.000	-0.000	-0.000	-0.000
	(-0.19)	(-0.19)	(-0.90)	(-0.97)
SALARY_CAP	0.002	0.002	-0.003	-0.000
	(0.06)	(0.07)	(-0.35)	(-0.04)
INTERCEPT	0.077	0.065	0.017	-0.006
	(0.57)	(0.64)	(0.62)	(-0.23)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
SE Clustered by firm	Yes	Yes	Yes	Yes
N	1337	1337	1336	1336
adj. R^2	0.177	0.177	-0.009	-0.008

‡Coefficient multiplied by 1000 for easiness of interpretation.

Notes: Table 4.7 presents the panel regressions results for the analysis of the effects of DB plan retentions and CEO participation in them on dividends (Panels A, B and C) and on investments (Panel D). ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed). t-statistics are shown in parentheses. All variables are defined in Table 4.1.

The models that I estimate are as follows:

$$DIVIDENDS_{it} \,/\, INVESTMENTS_{it} = \beta_0 + \beta_1 (CEO\_MAINDB_{i,t-1}) + \beta_2 (FUNDED_{i,t-1})\ \beta_k\ (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.5)$$

$$DIVIDENDS_{it} \,/\, INVESTMENTS_{it} = \beta_0 + \beta_1 (CEO\_MAINDB_{i,t-1}) + \beta_2 (FUNDED_{i,t-1}) + \beta_3 (CEO\_MAINDB_{i,t-1} * FUNDED_{i,t-1}) + \beta_k\ (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.6)$$

$$CHG\_DIVIDENDS_{it} \,/\, CHG\_INVESTMENTS_{it} = \beta_0 + \beta_1 (CEO\_MAINDB_{i,t-1}) + \beta_2 (FUNDED_{i,t-1}) + \beta_k\ (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.7)$$

$$CHG\_DIVIDENDS_{it} \,/\, CHG\_INVESTMENTS_{it} = \beta_0 + \beta_1 (CEO\_MAINDB_{i,t-1}) + \beta_2 (FUNDED_{i,t-1}) + \beta_3 (CEO\_MAINDB_{i,t-1} * FUNDED_{i,t-1}) + \beta_k\ (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.8)$$

Table 4.8: Additional analysis - Effects on aggregate irregular payouts

	Dependent variable: Aggregate irregular payouts		Dependent variable: Change in aggregate irregular payouts	
	(4.5)	(4.6)	(4.7)	(4.8)
CEO_MAINDB	0.002	0.003	-0.001	-0.001
	(1.18)	(1.32)	(-0.49)	(-0.43)
FUNDED	-0.001	-0.000	0.004	0.004
	(-0.51)	(-0.03)	(1.49)	(1.36)
CEO_MAINDB*FUNDED		-0.002		0.000
		(-0.73)		(0.05)
FUNDING_RATIO	0.011	0.010	0.007	0.007
	(1.37)	(1.34)	(0.83)	(0.83)
CEO_SALARY	-0.000	-0.016	-0.609	-0.608
	(-0.00)	(-0.01)	(-0.67)	(-0.66)
CEO_EQUITY‡	-0.055**	-0.054**	0.014	0.013
	(-2.40)	(-2.35)	(0.94)	(0.93)
CEO_TENURE	0.000	0.000	0.000	0.000
	(0.27)	(0.27)	(0.53)	(0.53)
FIRM_SIZE	0.001	0.001	0.000	0.000
	(1.36)	(1.38)	(0.45)	(0.45)
BM	0.001	0.001	0.003	0.003
	(0.65)	(0.68)	(1.31)	(1.30)
ROA	0.034**	0.034**	-0.033	-0.033
	(2.03)	(2.04)	(-1.46)	(-1.46)
LEVERAGE	0.001	0.001	0.002*	0.002*
	(1.09)	(1.08)	(1.68)	(1.68)
YIELD	0.038	0.038	-0.018	-0.018
	(0.72)	(0.73)	(-0.44)	(-0.44)
RETURN	-0.006**	-0.006**	-0.003	-0.003
	(-2.17)	(-2.16)	(-0.88)	(-0.88)
UNOB_INV	0.003**	0.003**	0.002***	0.002***
	(2.33)	(2.36)	(3.06)	(3.02)
SALARY_CAP	-0.004	-0.004	-0.004	-0.004
	(-1.35)	(-1.30)	(-0.89)	(-0.89)
INTERCEPT	-0.021	-0.018	-0.022	-0.017
	(-1.51)	(-1.65)	(-1.50)	(-1.26)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
SE Clustered by firm	Yes	Yes	Yes	Yes
N	1343	1343	1343	1343
adj. R^2	0.047	0.047	0.012	0.012

‡Coefficient multiplied by 1000 for easiness of interpretation.

Notes: Table 4.8 presents the panel regressions results for the analysis of the effects of DB plan retentions and CEO participation in them on firms' aggregate irregular payouts. Aggregate irregular payouts are measured as the sum of stock repurchases and special dividends scaled by total assets. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed). t-statistics are shown in parentheses. All other variables are defined in Table 4.1.

The models that I estimate are as follows:

$$DIVIDENDS_{it} \text{ / } INVESTMENTS_{it} = \beta_0 + \beta_1 (CEO\_MAINDB_{i,t-1}) + \beta_2 (FUNDED_{i,t-1}) \beta_k \text{ (Controls)} + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.5)$$

$$DIVIDENDS_{it} \text{ / } INVESTMENTS_{it} = \beta_0 + \beta_1 (CEO\_MAINDB_{i,t-1}) + \beta_2 (FUNDED_{i,t-1}) + \beta_3 (CEO\_MAINDB_{i,t-1} * FUNDED_{i,t-1}) + \beta_k \text{ (Controls)} + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.6)$$

$$CHG\_DIVIDENDS_{it} / CHG\_INVESTMENTS_{it} = \beta_0 + \beta_1 (CEO\_MAINDB_{i,t-1}) + \beta_2 (FUNDED_{i,t-1}) + \beta_k \text{ (Controls)} + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.7)$$

$$CHG\_DIVIDENDS_{it} / CHG\_INVESTMENTS_{it} = \beta_0 + \beta_1 (CEO\_MAINDB_{i,t-1}) + \beta_2 (FUNDED_{i,t-1}) + \beta_3 (CEO\_MAINDB_{i,t-1} * FUNDED_{i,t-1}) + \beta_k \text{ (Controls)} + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.8)$$

Table 4.9: Additional analysis – Effect on investments

Panel A: Effect on investments (R&D)				
	Dependent variable: R&D		Dependent variable: Change in R&D	
	(4.5)	(4.6)	(4.7)	(4.8)
CEO_MAINDB	-0.002	0.002	0.000	-0.000
	(-0.36)	(0.37)	(0.38)	(-0.02)
FUNDED	0.000	0.005	-0.000	-0.001
	(0.02)	(0.64)	(-0.64)	(-0.55)
CEO_MAINDB*FUNDED		-0.009		0.000
		(-1.42)		(0.38)
FUNDING_RATIO	-0.002	-0.002	0.001	0.001
	(-0.12)	(-0.16)	(0.58)	(0.61)
CEO_SALARY	3.046	2.973	-0.551	-0.547
	(0.76)	(0.74)	(-0.88)	(-0.89)
CEO_EQUITY‡	-0.045	-0.043	-0.007	-0.007
	(-1.23)	(-1.20)	(-0.51)	(-0.52)
CEO_TENURE	0.001	0.001	0.001	0.000
	(1.31)	(1.33)	(1.40)	(1.40)
FIRM_SIZE	0.001	0.001	-0.000	-0.000
	(0.37)	(0.38)	(-0.46)	(-0.46)
BM	0.000	0.000	0.000	0.000
	(0.10)	(0.16)	(0.41)	(0.39)
ROA	-0.066	-0.065	0.005	0.005
	(-1.63)	(-1.62)	(0.86)	(0.86)
CFOP	-0.103**	-0.102**	-0.00510	-0.00519
	(-2.45)	(-2.42)	(-0.74)	(-0.74)
LEVERAGE	-0.000438	-0.000	0.000	0.000
	(-1.31)	(-1.38)	(1.24)	(1.26)
UNOB_INV	0.004	0.004	0.001	0.001
	(1.24)	(1.26)	(1.01)	(1.02)
SALARY_CAP	0.013	0.013	-0.001	-0.001
	(1.05)	(1.08)	(-0.82)	(-0.85)
INTERCEPT	0.019	-0.005	-0.004	-0.001
	(1.04)	(-0.32)	(-0.75)	(-0.19)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
SE Clustered by firm	Yes	Yes	Yes	Yes
N	1355	1355	1357	1357
adj. R^2	0.268	0.270	0.011	0.010

Panel B: Effect on investments (RUNI)

	Dependent varibale: RUNI		Dependent variable: Change in RUNI	
	(4.5)	(4.6)	(4.7)	(4.8)
CEO_MAINDB	-0.000	-0.002	0.001	0.002
	(-0.07)	(-0.28)	(0.23)	(0.36)
FUNDED	0.021**	0.019*	0.010	0.012
	(2.47)	(1.74)	(1.34)	(1.20)
CEO_MAINDB*FUNDED		0.004		-0.003
		(0.34)		(-0.30)
FUNDING_RATIO	0.043*	0.043*	0.037**	0.037**
	(1.77)	(1.80)	(2.02)	(2.02)
CEO_SALARY	-1.77	-1.77	-0.82	-0.85
	(-0.31)	(-0.31)	(-0.29)	(-0.29)
CEO_EQUITY‡	0.010	0.089	0.031	0.031
	(0.65)	(0.65)	(0.19)	(0.19)
CEO_TENURE	0.000	0.000	-0.001**	-0.001**
	(0.77)	(0.77)	(-2.16)	(-2.15)
FIRM_SIZE	-0.004	-0.004	0.000	0.000
	(-1.46)	(-1.47)	(0.21)	(0.21)
BM	-0.009	-0.009	0.005	0.005
	(-1.59)	(-1.60)	(1.42)	(1.43)
ROA	0.005	0.005	0.068*	0.068**
	(0.13)	(0.12)	(1.96)	(1.97)
CFOP	0.217***	0.216***	0.147***	0.148***
	(3.97)	(3.96)	(3.19)	(3.19)
LEVERAGE	-0.000	-0.000	-0.001	-0.001
	(-0.34)	(-0.33)	(-0.57)	(-0.58)
CURRENT_RATIO	-0.005	-0.005	0.016***	0.016***
	(-1.01)	(-1.02)	(4.75)	(4.76)
UNOB_INV	0.023***	0.023***	0.004	0.004
	(3.98)	(3.97)	(1.53)	(1.53)
SALARY_CAP	0.014	0.014	-0.001	-0.001
	(1.02)	(0.99)	(-0.20)	(-0.16)
INTERCEPT	0.005	-0.008	-0.106**	-0.080***
	(0.12)	(-0.26)	(-2.08)	(-2.87)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
SE Clustered by firm	Yes	Yes	Yes	Yes
N	1337	1337	1337	1337
adj. R^2	0.237	0.236	0.033	0.033

‡Coefficient multiplied by 1000 for easiness of interpretation.

Notes: Table 4.9 presents the panel regressions results for the analysis of the effects of DB plan retentions and CEO participation in them on investments measured as R&D divided by sales (Panel A) and Rate of undertaking new investments (RUNI) measured as: (Capital Expenditures + Acquisitions+ Advertising+R&D)/Total Assets (Panel B).

***, ** and * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed). t-statistics are shown in parentheses. All other variables are defined in Table 4.1.

The estimated models are shown below:

$$DIVIDENDS_{it} \,/\, INVESTMENTS_{it} = \beta_0 + \beta_1 (CEO\_MAINDB_{i,t-1}) + \beta_2 (FUNDED_{i,t-1})\ \beta_k\ (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.5)$$

$$DIVIDENDS_{it} \,/\, INVESTMENTS_{it} = \beta_0 + \beta_1 (CEO\_MAINDB_{i,t-1}) + \beta_2 (FUNDED_{i,t-1}) + \beta_3 (CEO\_MAINDB_{i,t-1} * FUNDED_{i,t-1}) + \beta_k\ (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.6)$$

$$CHG\_DIVIDENDS_{it} \,/\, CHG\_INVESTMENTS_{it} = \beta_0 + \beta_1 (CEO\_MAINDB_{i,t-1}) + \beta_2 (FUNDED_{i,t-1}) + \beta_k\ (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.7)$$

$$CHG\_DIVIDENDS_{it} \,/\, CHG\_INVESTMENTS_{it} = \beta_0 + \beta_1 (CEO\_MAINDB_{i,t-1}) + \beta_2 (FUNDED_{i,t-1}) + \beta_3 (CEO\_MAINDB_{i,t-1} * FUNDED_{i,t-1}) + \beta_k\ (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.8)$$

Table 4.10: Additional analysis – Tobit models

Panel A: Effect on dividends (PAYOUT)				
	Dependent variable: Dividend payout ratio		Dependent variable: Change in dividend payout ratio	
	(4.5)	(4.6)	(4.7)	(4.8)
CEO_MAINDB	0.073*	0.084*	-0.034	-0.060
	(1.84)	(1.74)	(-0.82)	(-1.05)
FUNDED	0.047	0.063	-0.036	-0.076
	(0.85)	(0.89)	(-0.43)	(-0.79)
CEO_MAINDB*FUNDED		-0.030		0.072
		(-0.41)		(0.66)
FUNDING_RATIO	0.196	0.194	-0.248	-0.243
	(1.12)	(1.11)	(-1.06)	(-1.04)
CEO_SALARY	-5.585	-5.912	-4.045	-3.251
	(-0.25)	(-0.26)	(-0.17)	(-0.14)
CEO_EQUITY‡	0.540	0.547	-0.759	-0.777
	(0.71)	(0.72)	(-0.54)	(-0.55)
CEO_TENURE	0.001	0.001	0.001	0.001
	(0.39)	(0.39)	(0.26)	(0.26)
FIRM_SIZE	0.026	0.026	0.015	0.015
	(1.39)	(1.38)	(0.78)	(0.79)
BM	-0.023	-0.022	-0.039	-0.040
	(-0.62)	(-0.60)	(-0.86)	(-0.88)
ROA	-0.057	-0.059	0.296	0.301
	(-0.19)	(-0.19)	(0.42)	(0.42)
CFOP	0.504	0.507	1.129**	1.122**
	(1.57)	(1.58)	(2.40)	(2.39)
LOSS	-0.201**	-0.203**	0.635***	0.640***
	(-2.11)	(-2.13)	(3.46)	(3.47)
LEVERAGE	-0.014*	-0.014*	-0.006	-0.005
	(-1.71)	(-1.73)	(-0.55)	(-0.52)
CAPEX	0.351	0.362	-0.543	-0.568
	(0.77)	(0.79)	(-0.80)	(-0.84)
UNOB_INV	-0.009	-0.009	0.028	0.028
	(-0.47)	(-0.45)	(0.86)	(0.83)
DIV_PAYABLE	0.000*	0.000*	-0.000	-0.000
	(1.77)	(1.79)	(-0.09)	(-0.13)
RETURN	-0.000	0.000	0.107	0.107
	(-0.00)	(0.00)	(0.95)	(0.95)
BETA	-0.147**	-0.148**	-0.037	-0.034
	(-2.06)	(-2.06)	(-0.48)	(-0.44)
SALARY_CAP	0.056	0.058	0.060	0.055
	(0.72)	(0.76)	(1.02)	(0.93)
INTERCEPT	0.372	0.369	0.070	0.077
	(1.53)	(1.52)	(0.20)	(0.22)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
SE Clustered by firm	Yes	Yes	Yes	Yes
N	1357	1357	1357	1357
Pseudo R^2	0.0426	0.0427	0.0115	0.0115

Panel B: Effect on aggregate irregular payouts

	Dependent variable: Aggregate irregular payouts		Dependent variable: Change in aggregate irregular payouts	
	(4.5)	(4.6)	(4.7)	(4.8)
CEO_MAINDB	0.006	0.005	-0.001	-0.001
	(1.31)	(1.01)	(-0.51)	(-0.45)
FUNDED	0.000	-0.000	0.004	0.004
	(0.03)	(-0.06)	(1.52)	(1.38)
CEO_MAINDB*FUNDED		0.001		0.000
		(0.15)		(0.06)
FUNDING_RATIO	0.028	0.028	0.007	0.007
	(1.54)	(1.53)	(0.85)	(0.85)
CEO_SALARY	-6.422*	-6.430*	-0.616	-0.615
	(-1.79)	(-1.79)	(-0.68)	(-0.67)
CEO_EQUITY‡	-0.087	-0.087	0.014	0.014
	(-0.90)	(-0.90)	(0.98)	(0.97)
CEO_TENURE	0.000	0.000	0.000	0.000
	(0.23)	(0.23)	(0.57)	(0.57)
FIRM_SIZE	0.003	0.003	0.000	0.000
	(1.56)	(1.56)	(0.46)	(0.46)
BM	0.006	0.006	0.003	0.003
	(1.22)	(1.22)	(1.30)	(1.29)
ROA	0.136***	0.136***	-0.034	-0.034
	(3.17)	(3.17)	(-1.50)	(-1.49)
LEVERAGE	0.000	0.000	0.002*	0.002*
	(0.34)	(0.35)	(1.70)	(1.70)
YIELD	0.126	0.126	-0.017	-0.017
	(0.95)	(0.95)	(-0.43)	(-0.43)
RETURN	-0.004	-0.004	-0.003	-0.003
	(-0.58)	(-0.59)	(-0.89)	(-0.89)
UNOB_INV	0.005**	0.005**	0.002***	0.002***
	(2.50)	(2.50)	(3.09)	(3.04)
SALARY_CAP	-0.000	-0.000	-0.004	-0.004
	(-0.05)	(-0.06)	(-0.90)	(-0.90)
INTERCEPT	-0.100***	-0.100***	-0.017	-0.017
	(-3.13)	(-3.15)	(-1.28)	(-1.28)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
SE Clustered by firm	Yes	Yes	Yes	Yes
N	1343	1343	1343	1343
Pseudo R^2	0.2192	0.2192	0.0110	0.0110

‡Coefficient multiplied by 1000 for easiness of interpretation.

Notes: Table 4.10 presents the Tobit regressions results for the analysis of the effects of DB plan retentions and CEO participation in them on dividend payout (Panel A) and aggregate irregular payouts (Panel B). ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed). t-statistics are shown in parentheses. All other variables are defined in Table 4.1.

The models that I estimate are as follows:

$$DIVIDENDS_{it} \,/\, INVESTMENTS_{it} = \beta_0 + \beta_1 \, (CEO\_MAINDB_{i,t-1}) + \beta_2 \, (FUNDED_{i,t-1}) \, \beta_k \, (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.5)$$

$$DIVIDENDS_{it} \,/\, INVESTMENTS_{it} = \beta_0 + \beta_1 \, (CEO\_MAINDB_{i,t-1}) + \beta_2 \, (FUNDED_{i,t-1}) + \beta_3 \, (CEO\_MAINDB_{i,t-1} * FUNDED_{i,t-1}) + \beta_k \, (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.6)$$

$$CHG\_DIVIDENDS_{it} \,/\, CHG\_INVESTMENTS_{it} = \beta_0 + \beta_1 \, (CEO\_MAINDB_{i,t-1}) + \beta_2 \, (FUNDED_{i,t-1}) + \beta_k \, (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.7)$$

$$CHG\_DIVIDENDS_{it} \,/\, CHG\_INVESTMENTS_{it} = \beta_0 + \beta_1 \, (CEO\_MAINDB_{i,t-1}) + \beta_2 \, (FUNDED_{i,t-1}) + \beta_3 \, (CEO\_MAINDB_{i,t-1} * FUNDED_{i,t-1}) + \beta_k \, (Controls) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (4.8)$$

Chapter 5: Determinants of pension buy-ins and buy-outs

5.1 Introduction

The cost of providing DB plans has increased significantly in the last few decades for sponsoring companies in the UK and elsewhere (Kiosse and Peasnell, 2009). More transparent accounting standards, fluctuations in financial markets and increases in life expectancy have had a major and immediate impact on a firm's pension liabilities and led to the reduction in the benefits provided to new and/or existing members (Munnell, 2006; Glaum, 2009; Kiosse and Peasnell, 2009; Yermo and Severinson, 2010). In response to those challenges, companies have taken significant steps to reduce the pension risk. The closure of DB plans to new entrants, pensionable salary caps and freezing the accrual of future benefits to existing members have become very common (Klumpes et al., 2009). More recently, pension de-risking strategies are gaining ground among UK's biggest companies. Common de-risking strategies involve shifts in pension assets from risky equities to bonds, longevity swaps and pension buy-ins or buy-outs (partly or fully) (Monk 2009; Blake et al., 2013). For example, UK pensions have reduced assets allocated to equity investments from 66% in 2005 to 43% at the end of 2015 while asset allocation in bonds has increased from 25% in 2005 to 37% in 2015 (Willis Towers Watson, 2016). This strategy is not beneficial for all firms in order to limit pension risk. In general, the nature of liabilities should determine the asset allocation type. For example, mature funds will not require any significant new contributions and thus the objective will be less risky assets while the opposite will be the case for less mature pension plans. Longevity swaps involve the transfer of longevity risk to an insurance company. Pension assets remain with the firm along with the investment risk associated with them. Both buy-ins and buy-outs involve firms that sponsor DB plans buying bulk annuities from insurance companies. A pension buy-in is a strategy that takes place when trustees purchase an insurance policy as an investment of the plan generally by paying an upfront premium. In this case, the beneficiaries remain members of the pension scheme, and the links between the sponsor and the trustees are maintained. A pension buy-out refers to companies transferring either part (partial buy-out) or all (full buy-out) of their pension liabilities to an insurance

company for a premium.[65] Once the insurance policies take effect, the insurance company is responsible for ensuring the payment of pension benefits. Hence, there are no more links between the pension scheme beneficiaries and the former sponsor firm and trustees after the buy-out occurs. In both cases, there are benefits for the plan members since contrary to the sponsoring company the insurance company is required to hold surplus assets to support the insurance policy.

The ultimate goal of such transactions is to hedge/insure against pension risk. Existing literature suggests that factors such as managerial risk aversion (Stulz, 1984), taxes (Smith and Witt, 1985), bankruptcy costs (Mayers and Smith, 1982), investment opportunities (Mayers and Smith, 1982; Froot, Scharfstein and Stein, 1993) and earnings management (DeMarzo and Duffie (1995) are among others some of the determinants of corporate demand for hedging/ insurance. Regarding pension risk hedging transactions, the risk management/ transfer is different in each strategy. The effectiveness of pension asset allocation from equity to bonds as a pension risk management strategy is not always guaranteed and will depend on the characteristics of the pension fund and market conditions. Likewise, longevity swaps transfer only longevity risk. On the other hand, buy-ins and buy-outs transfer not only longevity but other pension risks such as interest rate risk, inflation risk and investment risk (Lin, MacMinn and Tian, 2015). Nevertheless, de-risking strategies involve significant costs, and benefits do not always outperform costs (Lin, Macminn and Tian, 2015).

The aim of this chapter is to provide an in-depth analysis of the UK buy-in and buy-out market by examining firm and pension plan characteristics of companies who undertake such transactions. Using a sample of UK firms that undertook a buy-out or a buy-in transaction during the period 2005 – 2015, I find that firms that implement buy-ins have larger and more funded pension plans, are more profitable and have higher union densities. Moreover, firms that complete buy-outs have larger

[65] The buy-out premium is estimated to be around 30% to 50% of the value of the liabilities based on FRS 17/ IAS 19 pension standards (The Actuary, 2016); If only pensioner liabilities are considered this premium reduces to around 10% above the FRS 17 / IAS 19 accounting liabilities, (LCP, 2008)

pension plans and allocate less pension assets in equity. Moreover, the number of employees is negatively associated with both transactions implying it is costlier for those firms to conduct either a buy-in or buy-out transaction. While union density is positively associated with buy-ins, it has a negative effect on the likelihood of buy-outs suggesting that unions do support buy-in but not buy-out transactions possibly because the latter are associated with plan winding-ups. Overall, these findings suggest that there are differences in the underlying determinants of pension buy-ins and buy-outs although the strategies seem to be similar in nature.

The study contributes to the emerging literature on pension de-risking strategies by examining their determinants. Although these transactions have several benefits for plan members, those benefits are not straightforward for sponsoring firms due to the costs that they involve. In addition, de-risking strategies could protect the sustainability of DB plans in both developing and developed countries (Blake et al., 2013; Monk, 2009) and therefore understanding determinants of these strategies is important not only for market participants to make informed investment decisions but also for policy makers to be able to make relevant adjustments which favour and/or may reduce the costs of such transactions. Moreover, the study extends the literature on corporate demand for hedging/insurance (e.g. Hadlock and Pierce, 2010; Dalton and Holland, 2017) by documenting characteristics of firms that hedge against pension risk. The remainder of the study is organised as follows: Section 5.2 provides the background to pension buy-ins and buy-outs; Section 5.3 refers to the literature review and the development of the hypothesis; Section 5.4, presents the research design; Section 5.5, discusses the sample and descriptive statistics; Section 5.6, presents the empirical findings; finally, section 5.7 concludes.

5.2 Background and developments of buy-in/ buy-out strategies in the UK and comparison with the US.

Pension buy-ins are insurance transactions where the sponsoring firm purchases a bulk annuity to hedge the risks (typically) associated with a subset of the plan's liabilities, usually focused on pensioner members. The pension fund in this case remains with the sponsoring firm while the annuities become an asset of the

plan. The insurance company pays a stream of income to the plan exactly matching the insured liabilities. In this case, the insurance company has no direct relationship with pension fund members. Rather, it is the firm and trustees that have legal responsibility for paying member benefits.

The most common solution for dealing with pension longevity risk in a DB pension plan is to sell the liability via an insurance or reinsurance contract (Blake et al., 2013). This is commonly known as a pension buy-out. Pension buy-outs became known in the UK market in 2006 where many insurance companies were set up specifically for this purpose (Blake et al., 2013). Essentially, in a buy-out transaction, the firm sells its pension liabilities to an insurance company for a specific premium. This is a final settlement of the pension liabilities and the promise to the pension fund member is transferred from the pension fund to the insurance company. In the case where the company does not have the financial resources to pay the full cost of the buy-out, the pension deficit (on a buy-out basis) is replaced by a loan that, unlike pension liabilities, is an obligation that can be easily understood by investors (Blake et al., 2013). The result is that pension liabilities are removed from the sponsor company's financial statements. Then the pension fund is typically wound up and the trustees are discharged. Pension assets are transferred to the insurance company, which becomes responsible for paying pensions. Each plan member has now an individual policy with the insurance company. There are two main types of pension buy-outs[66]: full and partial. Full buy-outs involve the full transfer of the schemes' liabilities to an insurer, usually followed by the plan winding up. Historically, full buy-outs have been the most common type of buy-outs. On the other hand, partial buy-outs refer to the partial transfer of a cross-section of the plan's liabilities to an insurance company, usually as part of a phased strategy to reduce pension risk. Most often partial buy-outs are structured as an investment of a firm covering part or all of the plan's pensioners. A full buy-out can be achieved from a large pension plan by combining a number of partial buy-outs across several insurance firms. In terms of cost, pensioner buy-ins are considered more affordable compared

[66] Buy-outs that are conducted with a non- FSA authorised insurance companies are known as non-insured buy-outs. This route is considered cheaper compared to the ones conducted with a regulated insurer. The Pension Regulator has taken measures to more closely regulate such transactions.

to full buy-outs. Conditions are more favourable for pension buy-ins if pension plan assets are invested on gilts[67] while this is not the case for pension buy-outs. Most pension plans do not hold fully matching investments, so falling gilt yields and subdued equity markets have driven up buy-out deficits (Lane, Clark and Peacock (LCP), 2013).

The pension buy-in/ buy-out market became active in the UK in 2006. At that time, the only insurance companies that offered these services were Prudential (UK) and Legal & General, and they were involved in a large number of transactions which approximated £1.5 to £2 billion a year with the majority being pension schemes that were winding-up due to the insolvency of the sponsoring companies (LCP, 2008). The opportunities that were offered in the UK buy-out market started to attract new insurers with some of them being set up solely for the purpose of pension de-risking. For example, Paternostar, (now acquired by Rothesay Life) Pension Insurance Corporation (PIC), Synesis (acquired by PIC), Lucida (stopped business in 2012) and MetLife. These companies were backed by investment banks and private equity investors (Blake et al., 2013). Goldman Sachs also established its own pension insurer, Rothesay Life, in July 2007. Established insurers such as Norwich Union, AEGON and AIG Life also joined the pension de-risking market. In 2012, Partnership and Just Retirement joined the buy-in and buy-out market bringing in their medical underwriting expertise. Medical underwriting, which is now common place in the individual annuity market (i.e., in relation to defined contribution pensions), has the potential to reduce the cost to the scheme of the longevity hedge compared to standard annuities, on the grounds that certain members might have lower than average life expectancy as a result of their lifestyle or some serious life-shortening illness (Blake et al. 2013). Canada Life and Scottish Widows joined the market in 2015. Currently, there are nine insurers operating in the pension de-risking market. Table 5.1 shows the buy-in and buy-out volumes from 2007 until 2015 by insurer and market totals. In general, the table shows that the market share of these insurance companies has been changing during the years with PIC and Legal & General leading the market more recently. In addition, the table shows that levels of

[67] A gilt is a UK Government liability in sterling, issued by HM Treasury and listed on the London Stock Exchange.

buy-in and buy-out transactions have been volatile during the sample period. Major events such as the financial crisis, quantitative easing and the subsequent economic recovery as well as the introduction of Solvency II[68] have had significant impact in transaction volumes. More specifically, buy-in and buy-out volumes increased significantly in 2008 (£7.9 bn) compared to 2007 (£2.9bn). The LCP (2008) report suggests that among the main factors that contributed to this are: higher life expectancy assumptions, intense competition in the de-risking market and more sophisticated investment techniques used by insurers. In addition, another contributing factor for the increase in the buy-outs market is the difference in discounting factors used by insurers and sponsoring firms. Insurers use investment grade corporate bonds and other assets which have higher yields while sponsoring firms use government bonds (UK gilts). Timing differences in the values of those assets create short- term opportunities for favourable pricings in buy-in deals. Buy-in and buy-out volumes were lower in 2009 (£3.7 billion) than in 2008 (£7.9 billion). This reflects the effects of the financial crisis on both the demand and the supply side: reduced demand from pension schemes being cautious in the light of market uncertainties and insurers facing capital constraints and being under pressure to preserve capital (LCP, 2010).[69] Another source of uncertainty in this period was the introduction of Solvency II in 2009 which had a major impact on insurance firms' capital requirements. Although it was not formally implemented in the EU until January 1, 2016, insurance companies had to go through a period of adjustment. In terms of buy-ins and buy-outs Solvency II increases the security of benefits that are insured through a buy-out or buy-in because, in general, it increases the level of minimum capital required by insurance companies to protect pension liabilities as compared to the minimum requirements of Solvency I. Buy-in and buy-out volumes seem to be slightly lower in 2011 as compared to 2010, however, it should be noted that 2011 was a cornerstone year for the de-risking market as the volume of transactions including longevity swaps reached £12.3bn. The increased activity in

[68] The Solvency II Directive (2009/138/EC) is a Directive in European Union law that codifies and harmonises the EU insurance regulation. It primarily concerns the amount of capital that EU insurance companies must hold to reduce the risk of insolvency.

[69] The significant effect that the financial crisis had on the buy-out market can be illustrated by the example of Paternostar who although having almost 50% of the market share in 2007, in May 2009 entered in an agreement with FSA that it would not write any business for the time being.

the market is principally a result of rising corporate bond spreads which contributed to competitive pricing from insurers. This led to an increase in the number of pension buy-ins, especially for plans holding gilts. On the other hand, there was a reduction in full buy-out transactions due to adverse conditions in equity markets and very low gilt yields (LCP, 2012). Total buy-in and buy-out volumes were £4.4bn in 2012 compared to £5.2bn in 2011. However, despite the lower total volumes, 2012 saw a four year-high for the number of large over £100m buy-in and buy-outs (LCP, 2013). The total transaction volume almost doubled in 2013 (£7.5bn) compared to 2012 (£4.4bn) which reflects the effects of the economic recovery. The impact of the economic recovery is further reflected in the transactions volumes in 2014 and 2015 which both exceed £10bn.

"Insert Table 5.1 here"

In the US, although it is considered the largest global retirement market in terms of pension assets, the buy-in and buy-out activity has been very slow (Agius, 2016). The first de-risking transaction in the US market took place in May 2011, when Prudential (U.S.) announced a $75 million buy-in. This was followed by other large buy-outs such as Verizon ($7.5bn) and General Motors ($26bn) in 2012; Bristol Myers ($1.4bn), Motorola ($3.1bn) in 2014; Kimberly Clark ($2.5bn) and Phillips ($1.1bn) in 2015. The US market has been dominated by pension buy-outs while buy-ins tend to be fewer (Sullivan, 2013). In addition, buy-ins are generally undertaken by plan sponsors with a foreign parent outside the US who reports under IFRS rather than US GAAP (LCP, 2015). This might simply reflect the ability to carry out a buy-out at affordable prices (LCP, 2015).

In general, there are many differences in the structure or governance of US and UK DB pension plans that affect the buy-in and buy-out activity levels (Monk, 2009). According to Agius (2016), the US pension system is less complex and as such should make the de-risking activities simpler. However, a more complex pension system and set of regulations might be a triggering factor for such risk management transactions. For example, a major difference between the two countries is related to the indexation of pension plans. In the US, benefits are typically not inflation-linked, reducing the pension plan's exposure to longevity risk

while this is not common in the UK (Agius, 2016). To illustrate this, Clark and Monk (2006) refer to the work of Feldstein (1981) who showed that by switching to a fully indexed pension for a male aged 65 years (assuming 6 per cent per annum) from a nominal pension benefit would increase the pension cost by 50 percent. Indexation, even when subject to a capped rate, is a particular problem when combined with the effect of salary growth and the consequently high final salary levels that many times are used as the basis for calculating the pension benefits.

Moreover, another significant difference among the DB plan systems in the above two countries is the crucial role of the trustees in the UK (Cocco and Volpin, 2007). In the US, the pension trust is fully an asset of the corporation. The directors of the sponsoring company usually make decisions regarding the pension plan, for example on how to invest its assets. In contrast, in the UK trustees manage the pension plan, and they have significant powers that they are (in theory) obliged to execute in the best interests of the plan beneficiaries. Thus, in the US, decisions for buy-ins and buy-outs are made by firms' management while in the UK such decisions are made by trustees. This is another source of complexity of UK pension plans which might affect the differences observed between the US and UK buy-in/buy-out activity level. In addition, there are also differences related to the insurance sectors in the UK and the US. The US insurance industry offers weaker insurance guarantees as compared to the UK (Monk, 2009). As a result, existing plan members may oppose buy-in and buy-out transactions. Moreover, there are more general differences such as cultural and legislative. For example, there are differences between the UK and the US legal systems and as in other cases differences in institutional and legislative settings might have a potential effect in the differences observed in the buy-in and buy-out markets in the two countries. Finally, Monk (2009) in an analysis of the buy-outs market in the UK concludes that DB plans are considered a burden for both US and UK firms. However, as the author concludes, while UK policymakers consider buy-outs as a way to manage the burden of DB schemes, the US legislators are committed to the idea that DB pensions can be saved and as such they see buy-outs as threat to the sustainability of DB pensions.

5.3 Literature review and research objectives

There are three streams of literature relevant to this study. The first is the literature that focuses on the corporate demand for hedging; the second refers to studies about de-risking strategies; finally, the third refers to studies that examine the closure of DB plans. The following subsections discuss each stream of the literature and develop the hypotheses to be tested in this chapter.

5.3.1 Corporate demand for hedging

Every corporation faces risks for which they take the necessary measures to manage. In general, firms tend to use hedging to manage risks. Nance, Smith and Smithson (1993) refer to corporate hedging as the use of off-balance sheet mechanisms like options, futures, forwards and swaps to reduce volatility in firm value. Alternatively, firms can hedge against risks by modifying the way they fund assets to reduce risk exposure or by buying insurance contracts (Mayers and Smith, 1982). Mayers and Smith (1982) and Smith and Stultz (1985) argue that the use of hedging has several benefits such as reduction in expected costs of bankruptcy, reduction in agency costs as well as reduction in expected taxes and optimal risk sharing. In particular, they argue that for a solvent firm the use of hedging limits the probability of going bankrupt by reducing the volatility of the firm value and as a result decreasing the cost of financial distress. Similarly, transaction costs of bankruptcy can prompt corporations to buy insurance, shifting the risk of incurring those costs to the insurance company (Mayers and Smith, 1990). Warner (1977) shows that the direct costs of financial distress (e.g. legal costs required for re-organisation or liquidation) are less than proportional to size indicating that small firms are more likely to hedge. Likewise, Hadlock and Pierce (2010), using a sample of US firms from 1995-2004, find that size is also important for costly external financing because larger firms have better access to capital markets and are less likely to face financial constraints. Thus, it is more likely for larger firms to be unhedged or only partially hedged. On the contrary, Block and Gallagher (1986), Booth, Smith and Stoltz (1984) and Nance et al. (1993) find that larger firms are more likely to hedge. In particular, they argue that hedging activities involve informational scale economies and larger firms are more likely to employ specialised managers to manage hedging

programs. Moreover, the swap, forwards and futures over-the-counter options markets exhibit significant scale economies in the structure of transaction costs, implying that large firms are more likely to hedge with these instruments.

Myers (1977) shows that companies have incentives to give up investment opportunities with positive net present value (NPV). He argues that in some cases, with risky debt in the capital structure, undertaking a positive NPV project makes shareholders worse off because the projects benefits accrue to the bondholders. Mayers and Smith (1987) show that in certain cases, the purchase of insurance contracts controls this underinvestment case by restricting the circumstances at which the firm would default on bond payments. As a result, firms with more growth opportunities are more likely to hedge, with the aim of reducing firm value volatility. Moreover, since the underinvestment problem is more pronounced in firms with more debt in their capital structure, firms with higher debt are more likely to hedge. For example, Nance et al. (1993) find for a sample of US firms in 1986, that firms which hedge have more growth options in their investment opportunities. Similarly, Graham and Rogers (2002) examine corporate derivative holdings of US firms for the period March- December 1995 and find that hedging increases with investment opportunities and financial leverage. Moreover, Dalton and Holland (2017) using a sample of US firms over the period 1992-2005, find that firms with more investment opportunities are more likely to hedge the risk of health benefit payments through insurance contracts. However, they find a negative relation between market leverage and health risk hedging.

5.3.2 Literature on buy-ins and buy-outs

Although corporate hedging in general has attracted significant attention in the literature, it is only recently that the huge economic significance of longevity risk for corporations has begun to be recognised and quantified (Blake et al., 2013). As a result, the literature on pension de-risking strategies is very scarce and the available studies constitute mainly of historical reviews of those strategies (e.g. Blake et al., 2013) or comparisons of the UK and US buy-outs market (e.g. Monk 2009). In particular, Blake et al. (2013) provide a review on the development of the ‘Life Market’ as the authors refer to the de-risking strategy market. They conclude

that the establishment of a traded market in longevity-linked capital market instruments could protect the sustainability of pension funds in both developing and developed countries. Monk (2009) arrives at a similar conclusion using descriptive qualitative analysis. More specifically, the author traces the development of the buy-out market from a transaction for insolvent plans to a transaction for solvent plan sponsors with funded plans. Comparing the UK and US buy-out market he concludes that insured buy-outs can significantly contribute to the continued existence of DB plans.

Kirkpatrick (2007) analyses how the pension buy-out market in the UK might be affected by the amendment to Financial Reporting Standard 17 (FRS 17) in December 2006. The author concludes that greater transparency in financial reporting of DB plans may encourage buy-outs and other risk management solutions. Greater transparency may highlight issues related to pension risk, which would force firms to take the necessary actions to remedy these issues, which would otherwise, have been ignored, detriment to the plan members and possibly shareholders.

Lin et al. (2015) find an appropriate de-risking method using an optimisation model that minimises the expected total pension cost subject to a conditional value-at-risk constraint on pension funding level. The authors conclude that the total pension cost (hedge ratio) increases (decreases) with the transaction cost, the counter-party default probability and the underfunding ratio. Moreover, they find that buy-ins are more sensitive to the default risk and that longevity hedging and buy-ins over perform buy-outs for underfunded plans.

Overall, the existing literature points out the importance of de-risking strategies and concludes that these strategies will play a significant role in the survival of DB plans

5.3.3 DB plan terminations

Another stream of literature relevant to this chapter is the one that analyses DB plan closures. Some of these studies have already been discussed in chapter 3; however, given their relevance to the present study, it is important to refer to some

of them again in this chapter. DB plan closure, either only to new entrants or new and existing entrants, is one of the most common ways that firms use to manage pension risk. Thus, determinants of such strategies are relevant to de-risking strategies as well. There has been a significant decrease in the amount of DB plans sponsored over the last three decades (Kiosse and Peasnell, 2009). Consequently, the main focus of existing literature tends to be on the reasons (determinants) of DB plan terminations, and their findings provide, in general, mixed evidence. The earlier studies analyse the termination of overfunded plans which were popular during the 1980s. The main findings indicate that plan terminations were attempts by financially distressed firms to access excess plan assets, potentially transferring wealth from employees to shareholders (Alderson and Chen, 1986; Hamdallah and Ruland, 1986; VanDerhei, 1987; Hsieh et al., 1990; Mittelstaedt, 1989; Thomas, 1989; Mittelstaedt and Regier, 1990; Petersen, 1992; Datta et al., 1995).

The economics behind DB plans have changed drastically over the last few years. Strict regulation amendments coupled with recent developments in the financial markets has resulted in severely underfunded DB plans (Munnell and Soto, 2007). More recent studies on DB plan terminations, such as Munnell and Soto (2007) and Comprix and Muller (2011), explore the potential effects that firm and pension plan characteristics have on the decision to close a DB plan, while other studies consider the effect of changes in labour characteristics and preferences on the decision to close a DB plan (e.g. Cowan and Power, 2003; Coronado and Copeland, 2004; Aaronson and Coronado, 2005; Kapinos, 2012; D'Souza, Jacob and Lougee, 2013). Kiosse and Peasnell (2009) suggest that increased costs related with DB plans seems to be in the main reason behind DB freezes in the UK and the US, and, although accounting regulation has had some influence, it does not appear to be the main reason. Moreover, Munnell and Soto (2007) examine firm, plan and industry characteristics of a sample of US firms during 2004 and 2005 and find that larger firms, firms that have low credit coverage relative to income, considerable legacy costs, low funding ratios and operate in R&D intensive industries are more likely to freeze their DB plans, while they do not find any significant effect of profitability on the decision to freeze DB plans.

Comprix and Muller (2011) however, find that large firms are less likely to freeze their DB plans and that the funding ratio does not affect the probability of freezing. Moreover, Beaudoin et al. (2010) and Comprix and Muller (2011) find that the profitability of the sponsor firm plays an important role in the decision to freeze. D'Souza et al. (2013) suggest that firms for whom pension terminations incorporate costs in relation to employee resistance, political visibility or explicit tax costs and firms that will likely have benefits from retaining DB plans, are more likely to convert to CB plans than terminate their plans altogether. It should be noted that the findings of prior literature, which is largely US-based, do not point to a single factor alone that drives DB plan terminations, but rather to a number of different factors combined.

While the existing literature examines determinants of demand for corporate hedging or corporate insurance and some studies explore pension buy-in and buy-out activities as well as their associated risks, little is known about the firm and plan characteristics that influence such activities. Understanding which firms carry out these transactions is not straightforward and is important. In particular, while traditionally there was a belief that only insolvent firms would undertake such activities (especially buy-outs), we now observe that financially healthy firms are also implementing buy-ins or buy-outs (Monk, 2009). In addition, de-risking strategies involve significant costs and benefits and do not always outperform the costs (Lin et al., 2015). Thus, it is of interest to understand their determinants from a firm's perspective. In addition, buy-ins and buy-outs have essential differences. A pension buy-out transaction removes the pension liabilities from the balance sheet and firms that undertake them are not subject to counter-party risk. However, in a pension buy-in the liabilities remain with the sponsoring company. As obligations of buy-in insurers are usually not fully collateralized, a significant credit risk arises (Roy, 2012). Therefore, determinants of a buy-in compared to a buy-out transaction should normally differ. To my knowledge, existing literature does not provide any evidence on the determinants of buy-ins or buy-outs. Therefore, this is an interesting research question in which I seek to shed light in this chapter.

5.4 Research design

I examine the determinants of a buy-in or buy-out using the following probit models:

$$BUYIN_{it} = \beta_0 + \beta_1 (PLAN\_SIZE_{i,t-1}) + \beta_2 (PBO_{i,t-1}) + \beta_3 (FUNDING\_RATIO_{i,t-1}) + \beta_4 (EQUITY_{it-1}) + + \beta_5 (HORIZON_{i,t-1}) + \beta_6 (EMPLOYEES_{i,t-1}) + \beta_7 (UNION_{i,t-1}) + \beta_8 (LEVERAGE_{ii,t-1}) + \beta_9 (ROA_{i,t-1}) + \beta_{10} (GROWTH_{i,t-1}) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (5.1)$$

$$BUYOUT_{it} = \beta_0 + \beta_1 (PLAN\_SIZE_{i,t-1}) + \beta_2 (PBO_{i,t-1}) + \beta_3 (FUNDING\_RATIO_{i,t-1}) + \beta_4 (EQUITY_{it-1}) + + \beta_5 (HORIZON_{i,t-1}) + \beta_6 (EMPLOYEES_{i,t-1}) + \beta_7 (UNION_{i,t-1}) + \beta_8 (LEVERAGE_{ii,t-1}) + \beta_9 (ROA_{i,t-1}) + \beta_{10} (GROWTH_{i,t-1}) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (5.2)$$

Where, BUYIN (BUYOUT) is an indicator variable that takes the value of 1 if the firm has implemented either a partial or full buy-in (buy-out) transaction and zero otherwise. Following the existing literature and market reports on de-risking strategies, I include several explanatory variables. The first set of explanatory variables refers to variables associated with the magnitude of the pension plan assets and liabilities. Existing literature on corporate demand for hedging/insurance provides mixed results with regards to the effect of size. Hadlock and Pierce (2002) show that larger firms are less likely to face financial constraints related to external finance and as such have more funds available. This makes larger firms less likely to hedge. However, Nance et al. (1993) find that larger firms are more likely to hedge given that they can use specialised management knowledge to undertake hedging activities. PLAN_SIZE[70] is measured as the natural logarithm of the fair value of plan assets. Larger plans tend to be associated with larger pension costs and as such firms with large pension plans are more likely to enter in de-risking transaction. On the other hand, larger firms with large pension funds have more access to external funds making an insurance contract relatively more expensive and therefore might deter firms with large plans to enter in such transactions. In addition, Comprix and Muller (2011) show that larger firms and firms with larger DB pension plans will face more resistance and will potentially experience higher reputational costs due to

[70] Plan size and firm size were significantly positively correlated in this sample. This shows that larger firms have large pension plans (in terms of pension assets). I selected plan size for the empirical analysis given that it better represents the magnitude of pension and inferences can also be made about the firm size.

greater potential negative media coverage. Therefore, I do not have any a priori expectations with regards to the sign of β_1. Moreover, PBO is the present benefit obligation scaled by total liabilities. This variable is used to examine how the size of the pension liability in relation to total liabilities affects the likelihood of a buy-in/ buy-out transaction. A firm with a proportionally larger pension liability will face higher costs for maintaining this plan, as such, it might be in the firm's interest to enter into a buy-in or buy-out transaction. On the other hand, the size of the pension liability is positively associated with the pricing of a buy-in/buy-out (LCP, 2013) and so, a higher price might act as a deterrent for a firm to perform such transaction. Hence, I do not make any predictions with regards to the sign of β_2 .

To capture the financial health of the pension plan I include FUNDING_RATIO which is measured as the fair value of pension plan assets divided by the present benefit obligation. Cowan and Power (2003), Comprix and Muller (2011), and D'Souza et al. (2013) suggest that employers are more likely to close DB plans that are costlier. The higher the pension plan deficit, the higher the cost. In addition, Rauh (2006) finds that contributions to DB pension plans pose a real constraint on firms' capital expenditures. To the extent that an overfunded plan is an indication of a healthier plan, firms with healthier pension plans might not be in need of de-risking. On the other hand, the uncertainty and risks associated with pensions might lead firms with overfunded plans to carry out such transactions. In addition, higher funding ratio is associated with better pricing (LCP, 2013). Therefore, once again, I do not have any a priori expectations with regards to the sign of on the coefficient on FUNDING_RATIO.

According to LCP (2009 and 2016) there are periods during which firms that have most of their assets invested in gilts benefit from better pricing. Consequently, asset allocation is another important determinant for buy-in/ buy-out transactions. I include EQUITY[71] which is the proportion of pension plan assets invested in equities. Such investments are considered riskier compared to fixed rate investments and

[71] Investment in gilts cannot be determined with accuracy because the available data reports them under the general category of bonds. For all firms in our sample the majority of pension assets are allocated in either bonds or equity with another small percentage being invested in property or other type of investment.

thus firms that invest their pension assets in equities might be less likely to enter into a buy-in/ buy-out transaction because they would face a less lucrative offer. I therefore predict a negative sign on β_4.

Moreover, I use two variables to capture the effect that the firm's plan/workforce maturity and number of employees have on the buy-in/ buy-out decisions. Pension plans that consist mainly of mature workforce are more likely to receive favourable pricing offers since their longevity risk is lower (LCP, 2008). In addition, Munnell and Soto (2007) show that plans that are offered to a greater number of employees will face greater constraints if they proceed in DB pension closures compared to plans that are offered to a smaller part of the workforce. I use HORIZON measured as the natural logarithm of the ratio of PBO to current service cost as a proxy for plan maturity following Amir, Guan and Oswald, (2010). Overall, an older (younger) workforce should lead to a smaller (larger) ratio of PBO to service cost, indicating a shorter (longer) investment horizon. According to LCP (2008) firms with a more mature workforce receive better pricing offers. However, firms with younger workforces will be more inclined to hedge against longevity and enter into de-risking activities. Therefore, I expect a negative sign on the coefficient on HORIZON. Moreover, the higher the number of EMPLOYEES (measured in millions) the more expensive such transactions will be for the firm. Thus, I predict a negative sign for β_6.

Plans that are subject to collective-bargaining must negotiate with trade unions for any major decisions affecting the plan including pension buy-ins and buy-outs. Existing literature shows that plans that are covered by unions are arguably more difficult to freeze compared to plans that are not covered by unions (Munnell and Soto, 2007; Kapinos 2009 and 2012; Comprix and Muller, 2011). UNION is measured as the union density per industry. As long as de-risking transactions are considered to have positive effects on the long-term sustainability of DB plans, then unions will support such transactions. However, anecdotal evidence shows that unions might question the transactions' benefits to employees. For example, in the US, the scheme beneficiaries of the telecoms group Verizon challenged the group's $7.5bn pension buy-out claiming that "the company failed in its fiduciary duty"

(Sullivan, 2013). Therefore, I do not make any predictions with regards to the sign of β_7 .

Moreover, following literature on corporate hedging, I include (LEVERAGE) measured as the book debt divided by the sum of the book debt and the market value of equity, where the book debt excludes the effect of pensions, following Rauh (2008); return on assets (ROA) measured as net income to total assets and market to book value of equity to capture growth opportunities (GROWTH).[72] In the general context of corporate hedging, firms with higher leverage, lower profitability and more growth (more investment opportunities) are more likely to hedge (e.g. Nance, 1993; Graham and Rogers, 2002; Dalton and Holland, 2017). On the other hand, existing literature shows that profitable firms do also take measures in order to reduce pension risk (Munnell and Soto, 2007). Hence, I predict a positive coefficient on LEVERAGE and GROWTH while I do not make any predictions with regards to the sign of the coefficient in ROA. Table 5.2 presents variable definitions.

All independent variables are measured at time t-1 to capture conditions that prevail before the transaction is completed and to avoid reverse causality issues. All models have industry and year fixed effects to control for cross-sectional differences within industries and time series differences within years. All models use robust standard errors clustered by firm to correct for heteroscedasticity and serial correlation (Rogers, 1993).

"Insert Table 5.2 here"

5.5 Sample and descriptive statistics

To perform the analysis on the determinants of buy-ins/buy-outs, I use a sample of FTSE All-Share firms which have sponsored a UK DB plan from 2005 until 2015. I choose 2005 as the starting year because this is the first year that firms use IFRS and also because de-risking transactions started in the UK only in 2006[73]. Data on buy-ins and buy-outs are hand collected from LCP reports (2008-2016) as well

[72] I also examined this using Tobin's q and there were no statistical differences.
[73] In 2006 there were only a few transactions conducted by private firms. As such the buy-in/buy-out transactions in the sample start in 2007.

as individual insurance companies' websites. The sample refers only to insured (Financial Services Authority (FSA) approved) buy-in and buy-out transactions from UK publicly traded firms. The rest of the data is extracted from Worldscope.

Tables 5.3 presents the number of firms that implemented a buy-in or buy-out transaction by year (PANEL A) and industry[74] (Panel B). This Table shows that the first buy-out transactions took place in 2007 while buy-ins only appeared in the UK market in 2008. Later on, there is a decline in the number of buy-outs, most probably as a result of the financial crisis as explained in a previous section. The number of buy-ins dropped although it seems that some transactions took place despite the effects of the market downturn. These were mainly as a result of low gilt yields and the adverse returns in the equity markets. The opposite can be observed from 2013 onwards when the number of buy-outs increase, and the number of buy-ins decreases which is because of the economic recovery. In total, there are 19 buy-in and 15 buy-out transactions during the sample period.

Panel B shows that the Manufacturing and Finance industries have implemented the most buy-in and buy-out transactions. A reason for this could be that Manufacturing is a mature industry and mature plans may benefit from better pricing offers due to lower longevity risk compared to newer industries, while Finance might benefit from better knowledge of hedging transactions. Industries such as Utilities and Chemicals have not implemented any such transactions during the sample period.

"Insert Table 5.3 here"

Table 5.4 Panels A and B, show the means, medians and the associated tests of differences in means and medians for buy-in and buy-out samples, respectively. In Panel A, PLAN_SIZE is significantly higher, on average, for firms that undertook a buy-in (7.159) as compared to firms that did not (5.938). Also, FUNDING_RATIO is significantly higher for buy-in firms (96.6%) relative to non-buy-in firms (87.5%). Moreover, firms that completed a buy-out have a lover proportion of assets invested in equity (38.85%) as compared to firms that did not (52.22%). In addition,

[74] Industries are based on the Fama and French 12 industry classification.

HORIZON, ROA and MB are significantly higher for buy-in firms (174.5, 8.6% and 4.421, respectively) as compared to non-buy-in firms (128.1, 5.5% and 2.697, respectively). These results suggest, on average, firms that carry out a buy-in have larger pension plans and are more funded as compared to firms that did not undertake such transactions. In addition, those firms are more profitable and have more growth opportunities. The difference in HORIZON shows that firms that implement a buy-in have a younger workforce (longer investments horizon) as compared to those that do not, suggesting insuring pensions for a mature workforce is more expensive.

Panel B, shows that FUNDING_RATIO and HORIZON are, on average, significantly higher for firms that implemented a buy-out (95.1% and 237.1, respectively) relative to those that did not (87.7% and 127.6, respectively). Moreover, EQUITY, UNION and LEVERAGE are, on average, significantly lower for firms that undertook a buy-out (22.72%, 18.19% and 0.227, respectively) relative to firms that did not (52.34%, 19.19% and 2.785). These results suggest that firms that implement a pension buy-out have more funded pension plans and have younger workforce. In addition, those firms invest a lower proportion of their assets in equity, have lower union density and lower leverage. These findings indicate that, on average, there are differences in pension plan and firm characteristics when comparing firms that implement a buy-in or buy-out transaction with firms that did not. In particular, firms that undertake buy-ins have, on average, larger plans, higher funding ratios, invest less in equities, and have a younger workforce, higher profitability and higher growth opportunities relative to firms that do not implement buy-in transactions. While firms that implement buy-outs have higher funding ratios on average, lower allocation of pension plan assets in equities, a younger workforce, lower union density and lower leverage.

“Insert Table 5.4 here”

Table 5.5 shows the pairwise correlations for the sample used in the empirical analysis. In particular, it shows that PLAN_SIZE (0.13, p=0.001), FUNDING_RATIO (0.13, p=0.001), HORIZON (0.06, p=0.05), LEVERAGE (0.05, p=0.05), ROA (0.07, p=0.05) and MB (0.06, p=0.05) are positively correlated to BUYIN; while EQUITY is

negatively correlated to BUYIN (-0.15, p=0.001). Moreover, FUNDING_RATIO (0.08, p=0.001) and HORIZON (0.06, p=0.05) are positively correlated with BUYOUT; while UNION (-0.04, p=0.1) and LEVERAGE (-0.05, p=0.05) are negatively correlated with BUYOUT. In general, these results provide some evidence that firms with more funded pension plans and longer investment horizons (younger workforce) are more likely to undertake a buy-in or buy-out transaction. Moreover, these results show that there is a positive association between profitability and pension buy-ins but not buy-outs while, leverage is positively associated with buy-ins but negatively with buy-outs.

The analysis discussed in this section provides descriptive information about the variables, without considering how those factors jointly may influence the likelihood of a buy-in or a buy-out. The next section reports the results of the multivariate probit model where variables that may have an impact on a firm's decision to implement a buy-in/buy-out transaction are modelled jointly.

"Insert Table 5.5 here"

5.6 Findings

Table 5.6 presents the results of the probit model on the determinants of buy-ins and buy-outs. Columns (1) and (2) present the findings when the dependent variable is BUYIN and BUYOUT, respectively. Column (1) shows that PLAN_SIZE, FUNDING_RATIO, UNION and ROA and MB have a positive effect on the probability of a pension buy-in while EMPLOYEES and LEVERAGE have a negative effect. These results imply that the probability of a firm implementing a buy-out increases for firms with larger pension plans, higher funding ratios and more profitable firms suggesting that financially healthy firms with financially healthy pension plans are more likely to proceed with a buy-in transaction. This is in line with literature which suggests that healthy firms are taking measures to control pension risk (e.g. Munnell and Soto, 2007). In addition, firms with higher union densities are more likely to undertake a buy-in, suggesting that unions support such transactions. Larger

workforce is a deterrent factor for buy-ins suggesting that it becomes more costly for firms to insure pension benefits as the employees numbers increase. I do not find evidence that factors such as the size of the pension liability (PBO), the pension asset allocation (EQUITY), the maturity of the plan (HORIZON), LEVERAGE and GROWTH have any effect on the likelihood of a pension buy-in. Column (2) shows that PLAN_SIZE and MB have positive and statistically significant coefficients (at 5% and 10% levels of significance, respectively) while EQUITY, EMPLOYEES, UNION and LEVERAGE have negative and statistically significant coefficients (at 1%, 1%, 10% and 10% levels of significance, respectively). These results suggest that firms with larger pension plans and firms with plan assets allocated in less risky assets are more likely to undertake a buy-out. Like buy-ins firms that have larger numbers of employees are less likely to undertake pension buy-outs. Moreover, lower leverage and more growth opportunities increase the likelihood of a pension buy-out. Contrary to the results for buy-ins unions do not favour buy-out transactions, suggesting that they perceive buy-outs to be riskier than buy-ins. Finally, I do not find any statistical evidence that the PBO, FUNDING, HORIZON and ROA have any effect on buy-outs.

Overall, these results suggest that firms that undertake pension buy-ins and buy-outs are, in general, large firms with healthier pension plans and better financial conditions which contradict the traditional view that insolvent firms are more likely to implement such de-risking transactions.

"Insert Table 5.6 here"

5.7 Conclusions

This chapter analyses pension buy-in and buy-out transactions in the UK during 2005 to 2015. More specifically, I analyse pension buy-in and buy-out market developments and empirically examine the determinants of those transactions during the period 2005-2015.

The UK has experienced a large amount of such transactions which were in part interrupted by the financial crisis but resumed soon after. On the other hand, in the US buy-out transactions are very few and buy-in transactions almost non-

existent. This is mainly because of the differences in the governance and regulation of pension schemes as well as cultural and legislative differences across the two countries. Although, it is believed that the way the US pension system is organised should provide more ground for de-risking transactions. In practice, this is not happening given the low numbers of buy-in and buy-out transactions in the US. These differences are also an indication of beliefs that policymakers and companies have in both countries regarding the survival of DB plans (Monk, 2009).

The findings on empirical analysis on the determinants of buy-ins and buy-outs show that firms with larger plans, higher funding ratios, lower leverage and higher profitability and union densities are more likely to conduct a buy-in transaction. Likewise, buy-out transactions are positively associated with larger plans and plans that invest fewer assets in equity. The number of employees is negatively associated with both transactions implying that it is more costly for firms to conduct either a buy-in or buy-out transaction. While union density is positively associated with buy-ins, it has a negative effect on the likelihood of buy-outs suggesting that unions support buy-in but not buy-out transactions. In addition, both transactions are associated with firms that have lower leverage and higher profitability.

Overall, this study is an initial attempt to document the financial determinants of buy-in and buy-out transactions. It should be noted that these results should be interpreted with caution due to the small sample size.

Appendix IV

Table 5.1: Market share for buy-in/buy-out activities for individual insurers

Name of insurer	Date of entry	2007	2008	2009	2010	2011	2012	2013	2014	2015
		£m	£m	£m	£m	£m	£m	£m	£m	£m
Legal and General	1986	1,207	1,940	880	898	1,461	1,011	1,320	5,969	1,977
Prudential	1997	55	1,125		900	338	412	245	1,706	1,515
Paternostar	Jun-06	1,436	1,061							
Aviva (formerly Norwich Union)	May-06	100	826	176	872	1,099	187	379	874	984
Pension Insurance Corporation	Oct-06		1,676	1,119	721	666	1,469	3,745	2,567	3,811
Synesis	Late 2006									
Rothesay Life	Jul-07		700	370	1,365	980	1,025	1,674	1,400	2,338
MetLife	Jul-07		231	488	364	625	256	39		
AEGON	Jan-07	99	124	155	23					
Lucida	Nov-07		165	500	100	45	40			
Alico (formerly AIG Life)	Apr-07	33	39	40	19					
Partnership	2012							84	247	277
Just Retirement	2012							6	441	956
Canada Life	2015									32
Scottish Widows	Nov-15									394
Total		2,930	7,887	3,728	5,262	5,214	4,400	7,492	13,204	12,284

Table 5.2: Variable definitions and sources

Variable	Description	Source
BUYIN	An indicator variable that equals 1 if the firm has implemented a pension buy-in and 0 otherwise.	Lane, Clark and Peacock (LCP) reports (2008-2016) and individual insurance companies' websites.
BUYOUT	An indicator variable that equals 1 if the firm has implemented a pension buy-out and 0 otherwise.	Lane, Clark and Peacock (LCP) reports (2008-2016) and individual insurance companies' websites.
PLAN_SIZE	PLAN_SIZE is measured as the natural logarithm of the fair value of plan assets.	Worldscope
PBO	PBO is the present benefit obligation scaled by total liabilities.	Worldscope
FUNDING_RATIO	FUNDING_RATIO is measured as the fair value of pension plan assets divided by the present benefit obligation.	Worldscope
EQUITY	EQUITY is the proportion of pension plan assets invested in equities.	Worldscope
LEVERAGE	Following Rauh (2008) this is calculated as follows: (Book Debt) / (Book Debt+ Market Value of Equity), where the book debt excludes the effect of pensions.	Worldscope
ROA	Net income divided by total assets.	Worldscope
HORIZON	The ratio of PBO to the current service cost (Amir, Guan and Oswald, 2010).	Worldscope
EMPLOYEES	The number of firms' employees in millions	Worldscope
UNION	UNION is measured as the union density per industry.	Office of National Statistics: Trade Union Statistics 1999-2013
PARTLY_CLOSED	An indicator variable that equals 1 if the plan is closed to new entrants only and 0 otherwise.	Hand- collected from Annual Reports.
FULLY_CLOSED	An indicator variable that equals 1 if the plan is closed to existing and new entrants and 0 otherwise.	Hand-collected from Annual Reports.

Table 5.3: Number of buy-ins and buy-outs by year and industry

Panel A: Buy-in and Buy-out transactions by year

Year	Buy-ins	Buy-outs	Total
2005			
2006			
2007		6	6
2008	7	3	10
2009	2	0	2
2010	4	2	6
2011	1	0	1
2012	3	0	3
2013	2	1	3
2014	0	1	1
2015	0	2	2
Total	19	15	34

Panel B: Buy-in and buy-out transactions by industry

Industry	Buy-ins	Buyouts	Total
Consumer Non-Durables	3	1	4
Consumer Durables	0	0	0
Manufacturing	3	3	6
Energy - Oil, Gas, and Coal Extraction and Products	0	2	2
Chemicals and Allied Products	0	0	0
Business Equipment	0	1	1
Telecoms	1	0	1
Utilities	0	0	0
Wholesale & Retail Trade	2	1	3
Healthcare, Medical Equipment, and Drugs	2	0	2
Finance	4	1	5
Other	4	6	10
Total	19	15	34

Notes: Table 5.3 presents descriptive information on pension buy-in and buy-out transactions by year (Panel A) and by industry (Panel B).

Table 5.4: Tests of differences in means and medians

PANEL A: Tests of means and medians for BUYIN (1) vs. NON BUY-IN (2) FIRMS

	Test of means				Test of medians			
	(1)	(2)	diff ((2) -(1))	tstat	(1)	(2)	diff ((2) -(1))	chi-square
PLAN_SIZE	7.159	5.938	-1.221	-5.816**	6.613	5.905	-0.708	57.55***
PBO	0.627	0.652	0.025	-0.224	0.492	0.471	-0.021	2.846*
FUNDING_RATIO	0.966	0.875	-0.091	-5.665***	0.951	0.878	-0.073	33.85***
EQUITY	38.85	52.22	13.37	6.249***	41.65	54.00	12.35	38.69***
HORIZON	174.5	128.1	-46.40	-2.748**	85.98	63.71	-22.27	12.03***
EMPLOYEES	25542.8	23172.3	-2370.5	0.562	18454.5	8162.0	-10292.5	10.31***
UNION	20.29	19.13	-1.160	1.283	18.60	18.60	0.000	4.767**
LEVERAGE	2.997	2.722	-0.275	-0.060	2.683	1.690	-0.993	10.88***
ROA	0.086	0.055	-0.031	-3.238***	0.072	0.054	-0.018	0.869
MB	4.421	2.697	-1.724	-2.617**	2.452	2.235	-0.217	3.441*

PANEL B: Tests of means and medians BUYOUT (1) vs. NON BUY-OUT (2) FIRMS

	Test of means				Test of medians			
	(1)	(2)	diff ((2) -(1))	tstat	(1)	(2)	diff ((2) -(1))	chi-square
PLAN_SIZE	6.163	5.979	-0.184	-0.1769	6.196	5.964	-0.232	2.705*
PBO	0.840	0.648	-0.192	0.6113	0.582	0.468	-0.114	0.019
FUNDING_RATIO	0.951	0.877	-0.074	-3.601***	0.989	0.880	-0.109	6.450*
EQUITY	22.72	52.34	29.62	9.621***	23.972	53.933	29.961	26.10***
HORIZON	237.1	127.6	-109.5	-2.145**	125.5	63.07	-62.43	30.92***
EMPLOYEES	8433.3	23573.1	15139.8	-0.066	9087.5	8319.0	-768.5	12.13***
UNION	18.19	19.19	1.000	1.786*	19.800	18.600	-1.200	0.037
LEVERAGE	0.227	2.785	2.558	1.766*	1.384	1.740	0.356	17.35***
ROA	0.079	0.056	-0.023	0.971	0.063	0.054	-0.009	0.015
MB	2.012	2.776	0.764	0.785	1.808	2.259	0.451	7.262**

Table 5.4 reports the means and medians and their respective tests of differences for firms that implemented a pension buy-in (BUYIN) and firms that did not (NON-BUYIN) (Panel A) and for firms that implemented a pension (BUYOUT) and firms that did not (NON-BUYOUT) (Panel B). ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed). Continuous variables are winsorized at 1% and 99% to avoit the effect of outliers. All variables are defined in Table 5.2.

Table 5.5: Correlation analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
BUYIN (1)	1.00											
BUYOUT (2)	-0.03	1.00										
PLAN_SIZE (3)	0.13***	0.00	1.00									
PBO (4)	0.01	-0.01	0.20***	1.00								
FUNDING_RATIO (5)	0.13***	0.08***	0.22***	0.02	1.00							
EQUITY (6)	-0.15***	-0.22	-0.23***	-0.09***	-0.33***	1.00						
HORIZON (7)	0.06**	0.05**	0.00	0.27***	0.05**	-0.23***	1.00					
EMPLOYEES (8)	-0.01	0.00	0.58***	-0.09***	0.03	-0.07**	-0.13***	1.00				
UNION (9)	-0.03	-0.04*	0.19***	0.07**	0.03	0.03	-0.01	-0.07	1.00			
LEVERAGE (10)	0.05**	-0.05**	0.16***	-0.10***	0.05**	-0.03	-0.02	0.06**	0.09***	1.00		
ROA (11)	0.07**	-0.02	0.02	0.12***	0.07***	0.09***	0.00	0.02	-0.05**	-0.07***	1.00	
MB (12)	0.06**	-0.02	0.05**	0.05**	-0.00	0.07**	-0.04*	0.01	0.02	0.63***	0.21***	1.00

Notes: Table 5.5 presents the Pearson correlation coefficients for the variables used in the empirical analysis. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed). All variables are defined in Table 5.3.

Table 5.6: Empirical findings: Determinants of pension buy-ins/ buy-outs

Dependent variable:	BUYIN (5.1)	BUYOUT (5.2)
PLAN_SIZE	0.452***	0.386**
	(3.72)	(2.36)
PBO	-0.165	-0.229
	(-0.63)	(-0.75)
FUNDING	3.444***	0.629
	(2.99)	(0.29)
EQUITY	-0.012	-0.048***
	(-1.39)	(-5.30)
HORIZON	0.000	0.000
	(0.42)	(0.62)
EMPLOYEES	-0.001**	-0.001***
	(-2.29)	(-2.60)
UNION	0.058***	-0.019*
	(2.70)	(-1.89)
LEVERAGE	-0.071***	-0.090*
	(-3.10)	(-1.79)
ROA	3.457**	0.075
	(2.04)	(0.06)
MB	0.078**	0.086*
	(2.33)	(1.79)
INTERCEPT	-11.53***	2.957
	(-6.37)	(1.21)
Industry Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
SE Clustered by fitm	Yes	Yes
N	950	1040
Pseudo R^2	0.324	0.483

Notes: Table 5.5 reports the Probit regressions results for the analysis of the determinants of pension buy-ins and buy-outs). ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels (two-tailed). t-statistics are shown in parentheses. All variables are defined in Table 5.2.

The models that I estimate are as follows:

$$BUYIN_{it} = \beta_0 + \beta_1 (PLAN\_SIZE_{i,t-1}) + \beta_2 (PBO_{i,t-1}) + \beta_3 (FUNDING\_RATIO_{i,t-1}) + \beta_4 (EQUITY_{it-1}) + + \beta_5 (HORIZON_{i,t-1}) + \beta_6 (EMPLOYEES_{i,t-1}) + \beta_7 (UNION_{i,t-1}) + \beta_8 (LEVERAGE_{ii,t-1}) + \beta_9 (ROA_{i,t-1}) + \beta_{10} (GROWTH_{i,t-1}) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (5.1)$$

$$BUYOUT_{it} = \beta_0 + \beta_1 (PLAN\_SIZE_{i,t-1}) + \beta_2 (PBO_{i,t-1}) + \beta_3 (FUNDING\_RATIO_{i,t-1}) + \beta_4 (EQUITY_{it-1}) + + \beta_5 (HORIZON_{i,t-1}) + \beta_6 (EMPLOYEES_{i,t-1}) + \beta_7 (UNION_{i,t-1}) + \beta_8 (LEVERAGE_{ii,t-1}) + \beta_9 (ROA_{i,t-1}) + \beta_{10} (GROWTH_{i,t-1}) + INDUSTRY\_FE + YEAR\_FE + \varepsilon_{it} \quad (5.2)$$

Chapter 6: Conclusions

6.1 Summary of findings and implications

In this thesis I analyse issues related to DB plan provision in the UK. Historically, most UK firms have sponsored DB pension plans (Kiosse and Peasnell, 2009). The increase in average life expectancy as well as adverse circumstances in the general economic climate has increased the cost of those plans (Yermo and Severinson, 2010). As a consequence, many firms have taken steps to reduce those costs (Klumpes et al., 2009). Pensionable salary caps as well as the closure of DB plans to new and existing entrants are very have become very common among UK firms (Klumpes et al., 2009). Several studies examine the factors behind DB plan closures and among others they identify managerial incentives (Hamdallah and Ruland, 1986); cash needs (Thomas, 1989); avoidance of future obligations (Petersen; 1992); changes in accounting regulation (Munnell and Soto, 2007; Beaudoin, Chandar and Werner, 2010; Comprix and Muller, 2011); and changes in labour characteristics and preferences (e.g., Cowan and Power, 2003; Coronado and Copeland, 2004; Aaronson and Coronado, 2005; Kapinos, 2012; D'Souza, Jacob and Lougee, 2013). However, despite the decline in DB pension provision DB plans remain important part of compensation for UK employees. For example, in 2015, in the UK, DB plan assets represent 68% of total pension plan assets (Willis Towers Watson, 2016). More recently, pension de-risking strategies have become very popular in the UK. The most common de-risking strategies involve shifts in pension assets from risky equities to bonds, longevity swaps and pension buy-ins or buy-outs (partly or fully) (Monk 2009; Blake et al., 2013). In this study I examine issues related to DB plan retention and pension buy-ins and buy-out. Specifically, in chapter 2 I discuss the main features of DB plans and I provide an overview of the changes in pension accounting standards and legislation in the UK. Having provided the necessary background information, in chapter 3, I examine the determinants of DB plan retentions in the UK. Specifically, I analyse the effect that labour market incentives, managerial incentives and the adoption of FRS 17 by UK firms have on the decision to retain DB plans. In addition, I investigate the effect that insider-trustees (i.e. corporate executives that are also trustees) have on DB plan retention

decisions. I find that firms in industries where human capital is important are more likely to retain DB plans fully open (i.e. to both new and existing members). These results suggest that DB plans are considered an important instrument to retain highly skilled employees consistent with the labour market literature. Moreover, I find that the likelihood of DB plan retention increases if the CEO and CFO are members of the main DB plan as the rest of the employees. On the contrary, if they are members of an exclusive executive DB plan they are more likely to close these plans to new entrants. This suggests that they fear that there might be repercussions to their own plans. On the contrary, I do not find any evidence that the adoption of FRS 17 has any effect on DB plan retention decisions. Moreover, I find that insider-trustees have a positive influence in the decision to maintain DB plans especially when they are members of these plans.

Drawing on the findings of chapter 3, in chapter 4 I examine the effects that DB plan retention and CEO participation in them have on firms' credit ratings as well as the impact that they have on corporate decisions such as capital investments and dividends. I find that DB plan retentions, either full or part, have adverse effects on credit ratings. However, when the CEO is a member of this plan there is a positive effect on credit rating suggesting that credit rating agencies do not incorporate in their credit assessments only quantitative information such as the costs associated with open DB plans but also qualitative information such as the fact that the CEO itself is a member of this plan. The latter is also supported by findings of prior research that executives that are members of DB plans are risk averse (e.g. Bebchuk and Jackson, 2005, Sundaram and Yermack, 2007; Gerakos, 2007; Wei and Yermack, 2009).

Chapter 5 is motivated by recent developments in the market for pension plan risk hedging. Specifically, in this chapter I provide a thorough discussion of the developments in the pension buy-in and buy-out market in the UK and I empirically examine determinants of such transactions from a firm and plan perspective. The buy-in and buy-out market became active in the UK since 2006 and although there was a slow down due to the financial crisis these transactions have resumed in even higher volumes. On the contrary, de-risking strategies are not very common in the USA (Agius, 2016). The main reasons for this are associated with differences in the

pension structure, pension plan governance as well as relevant legislations (Agius, 2016). Moreover, empirical findings in this chapter show that firms with large pension plans are more likely to implement a buy-in or buy-out transaction. Moreover, companies with higher funding ratios and higher profitability are more likely to implement a pension buy-in; while firms that complete buy-outs allocate less pension assets in equity investments. Even though union density is positively associated with buy-ins, it has a negative effect on the likelihood of buy-outs suggesting that unions do support buy-in but not buy-out transactions possibly because the latter are associated with plan winding-ups.

Given the importance of DB plans from a welfare point of view as well as the magnitude of pension liabilities the present study is of interest and has significant implications for pension beneficiaries, market participants and standard setters. The findings have significant implications for the design of compensation packages in general including those of executives. In particular, executives can influence the retention of DB plans and hence have an impact on the deferred compensation of employees and their welfare. Likewise, the findings have implications on the role of accounting in restraining (or encouraging) managerial risk taking with improved disclosures on managerial compensation. In addition, the study has implications for corporate governance arrangements. Specifically, the study highlights the role of insider trustees with regards to DB plan retentions. Moreover, the study has implications for shareholders and other stakeholders drawing on the analysis of the impact on dividends and capital investments provided in chapter 4. Finally, given that de-risking strategies may possibly protect the sustainability of DB plans, findings in chapter 5 have important implications not only for market participants to make informed investment decisions but also for policy makers to be able to make relevant adjustments which favour and/or may reduce the costs of such transactions.

6.2 Limitations

It should be noted that the findings in this thesis are subject to certain limitations. The generalisation of its findings is reduced by the use of a relatively small sample size in some of the empirical studies presented in this thesis. The small sample size is mainly because of the limited data availability on pensions and the significant amount of time required for the hand – collection of the pension

information. In particular, the analysis of the effect of insider trustees required extensive hand-collection of data on pension trustees. Moreover, this information was not available for all FTSE All-Share firms that sponsor a DB plan which is the initial sample in the study.

Furthermore, to the extent that a partial closure and a full closure are considered competing risks, a model such as the one developed from Fine and Gray (1999) would have been more appropriate. However, although such models are used heavily in biomedical science their use in accounting research is not possible now because of the time varying nature of the covariates.

Regarding chapter 5, to date there is limited number of transactions for pension buy-ins and buy-outs which significantly restricts the empirical analysis. Pension buy-in and buy-out data are limited because the market is relatively small compared to the total size of DB pension liabilities, although it is growing significantly.

6.3 Future research ideas

The limitations of this study provide opportunities for future research. Future research can further explore and analyse pension de-risking transactions. Data availability in the future could allow the use of more sophisticated methods for the empirical analysis of the determinants of de-risking transactions. In addition, availability of data in the future could facilitate the analysis of market effects of such transactions.

The present study analysed pension buy-in and buy-out transactions only. However, longevity is now recognised as an important risk that is faced by insurers, corporations and governments (Blake et al., 2013). The market for longevity swaps is developing to mitigate this risk. Therefore, the growth of this market provides an opportunity to include longevity swaps in future research on pension de-risking strategies.

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